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THE INFLUENCES OF GAMIFICATION ON USER EXPERIENCE IN THE HEALTHCARE SECTOR

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Abstract

Gamification is a considerably emerging trend focusing on the application of game mechanics to a non-game context. The objective of gamification implication in serious settings is to form the positive outcomes from the patients. While education and business have been taken advantages of gamification, the digital health domain just started the journey with this prevailing trend. That is why, there is an increasing demand for scientific research on the gamification in healthcare, especially the user experience under the gamified healthcare solution from the company perspective. With this inspiration, the study is conducted aiming at exploring the user experience under the impact of gamification in the healthcare context.

Study indicates that it is the affordances, which are also known as game elements that stimulate various psychological and behavioural experience for the users. The combination of the achievement-oriented, social-oriented and immersion-oriented affordances in the gamified healthcare solution triggers the various psychological and behavioural experience. These experiences are examined under three perspectives which are stimulation, interaction and sense-making. Through the stimulation lens, the psychological experiences are favourably formed and dominant the behavioural experience. While, the interaction lens indicates the dominance of the behavioural experience, especially the performance-related outcomes. The sense-making view shows the actor-related behavioural experience outweighs of the other outcomes.

The exploratory qualitative research and the semi-structured interviews are utilised to investigate the game affordances in the gamified solutions and the user experience from the gamified solution providers angles.

The study expectedly contributes to the literature' body of gamification by confirming the conceptualisation of the gamification and the formation of the user experience. The empirical implications are for the gamified healthcare solution design regarding the affordance combination and the utilisation of the insights from both patients and game players.

Keywords:
Gamification, patients experience, gamified healthcare solutions, healthcare context

Additional information
This research is conducted under the context of ICOry project in which the healthcare solutions are upgraded into the higher innovation level for the better patient-centric digital solution.

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1. INTRODUCTION

This thesis explores the user experience under the influence of gamification in the healthcare sector. For this purpose, the thesis starts with the introduction in which, the background of this research is introduced. Also, the research gap is identified explaining for the proposal of the research questions in the next section. This chapter is continued with the outlines of the whole study and closed by the key concepts which are significant to the understanding of the study.

1.1 The phenomenon of interest

Finland is of the three strongest health technology economies in the world (The Digital Economy and Society Index - DESI, 2018) and this also extends to healthcare. That is why Finnish digital health is the largest high-tech export (Business Finland, 2018). Almost 50 % of Finnish citizens use eHealth services (DESI, 2018) which are provided online without directly go to a hospital or meet doctors. Communication technologies, medical devices, machine learning or artificial intelligence, are continuously created, combined and enhanced to improve the standard of healthcare, particularly patient satisfaction. Patient-centred care is a crucial component of high-quality healthcare. It is linked with positive outcomes, such as treatment adherence, receipt of preventive care, improved clinical outcomes, and lower health care utilisation (Doyle et al., 2013). Particularly, enhancing the experience of paediatric care need to be prioritised due to the physical, mental and psychological vulnerability of children. Small children and their parents need specific care and attention during the whole treatment journey. Among various healthcare treatment, orthopaedics and traumatology are recorded as the largest surgical subspecialty in Finland, since this speciality involves approximately 40% of all surgical operations (ICOry, 2017). While in Norway, this is the second largest patient group accounting for 106,362 admissions which are 12% of all somatic inpatient admissions in 2011, and there is no signal of reducing (Norwegian Directorate of Health, 2012). It is not only about a large number of people suffering from these problems but it also because orthopaedic surgery is considered among the

most painful of surgeries (Pasero & McCaffery, 2007). A Dutch study discovered that 20–71% patient in the group suffered from moderate to severe pain during the 1–4 postoperative days (Sommer et al., 2008). Besides, patients tend to get confused or uncertain about many treatment-related issues such as how long the pains last, how can they prepare for the surgery at home or in the hospital, what should they do with the rehabilitation after the operation. Facing an orthopaedic operation is hugely challenging for anyone, especially the children. Many significant insights regarding the needs of both patient and healthcare professional were examined. From the patient sides, generally, they need to be well-prepared with the information of the surgery journey, communication tools connecting them and the doctors or nurses from the pre-operative and post-operative point of times effectively. In the healthcare professional perspective, they require better patient-hospital communication, integration of patient data into health information systems to reduce the daily recording tasks, digital tools to track the pain level of the children, help them get rid of the fears and support the whole care path (ICOry, 2017). In the digitalisation and individualisation, the "one size fits all" healthcare service is no longer appropriate. Both healthcare providers and patients need high innovative solutions for a higher standard of the healthcare system and better patient experience.

Regarding the customer experience, creating a secure customer experience is a leading management goal shared by the executives from the study conducted by Accenture (2015). The focus on customer experience increases since customers are interacting with the companies via various channels. The more touch points are generated, the more complicated customer experience is (Lemon & Verhoef, 2016). Examining, conceptualising or measuring customer experience is the long-run attempts. The Marketing Science Institute (2014) states that customer experience is one of the most significant research challenges in the upcoming years. That is why there have been constant calls for more search on customer experience including in specific sectors like healthcare. This research favourably responds to that call, and it is conducted under the context of digitalisation.

Information and communication technologies are primarily applied in the healthcare sector formulating the concept of electronic health - eHealth. It refers to "health

services and information delivered or enhanced through the Internet and related technologies" (Eysenbach, 2001). While mobile health (mHealth) describes a subset of eHealth, it is defined as "*the use of mobile computing and communication technologies in health care and public health*" (Free at al., 2013). These two concepts appear in this research in the scope of the orthopaedic and paediatric solutions to remote monitoring, communication, diagnostic and care decisional supports.

If connected health technologies are the enabler, then gamification can be considered as a mean to enhance the usability of those health technology solutions. Gamification is the application of game-related elements and principles in non-game contexts (Huotari & Hamari, 2012; Deterding et al., 2011). Gamification systems are designed to leverage people's natural desires for socialising, learning, competition, achievement, self-expression to the framing of a situation in the game (Lieberoth, 2014). First appeared around ten years before and gained widespread usage in 2010 due to the incorporation of social or reward aspects of games into software (Mangalindan, 2010), now gamification has been in its acute growing phase both in academia and industry. Under the healthcare context, gamification was early applied in the mobile app to encourage users to improve their health and well-being by doing exercise more such as Isocracy and QUENTIQ (Lister, 2014). Researchers in the public health sector have studies the implementation of gamification in self-management of chronic diseases (Almarshedi et al., 2016) and the mental problem (Brown et al., 2016) as well. Pokemon Go players took an extra 194 steps per day once they started using the app, approximately 26% more than usual (McFarland, 2016).

Similarly, Ingress is a mobile game that players are rewarded with action points. It means they are required to be physically active. Alternatively, Zombies Run! creates a scenario of the zombie apocalypse in which players have to complete a series of missions. The game requires the player to physically run, collect items and listen to various audio narrations to uncover mysteries. The successful application of game mechanism into reality and the continuous effort of academic scholars strongly prove that gamification is one of the futuristic approaches.

1.2 Research Gaps

Gamification became well-known in 2008. Just around a decade-year-old, gamification is still in its infancy. Academia has been witnessing a sharp increase in the number of studies on gamification. The works on gamification have been revealing the number of insights about different aspects of gamification application. However, many of them contribute to the education and learning domains (Hamari et al. 2014).

Regarding the health-related research, the majority of the research focuses on the development of healthy or beneficial habits. Also, significant findings provide the considerable amount of knowledge in different perspectives related to these aspects (Allam et al., 2015; Brauner et al., 2013; Cafazzo et al.,2012; Chen & Pu, 2014; Chen et al., 2014; Hamari & Koivisto, 2015; Jones et al., 2014; Riva et al., 2014; Thorsteinsen et al., 2014 or Watson et al., 2013). Most of those studies are on exercise domain while there are not enough papers on of gamification for treatment, especially for paediatric surgery.

In addition, the results are much about the effectiveness of using gamification instead of focusing on the user experience such as the increase of 50% in daily average frequency of blood glucose measurement in diabetes patients (Cafazzo et al., 2012), sharp increase in fruit and vegetable consumption on intervention days (Jones et al., 2014), or the significantly increased patient empowerment and reduced medication misuse (Riva et al., 2014).

Moreover, it is reported that only 16.8% of qualitative research of gamification have been conducted while the percentages of quantitative research are overwhelmingly dominant, at 60.4%. The qualitative studies on gamification are also relatively lower than the mixed method which reaches 22.7% in total around 270 empirical research (Koivisto & Hamari, 2019).

For those reasons above, qualitative research of user experience impacted by gamification in paediatric surgery is necessary and theoretically constructive.

1.3 Research aim and questions

This study aims at enlarging the knowledge of gamification, which is a potential and prevailing trend in the recent decade, in influencing the customer experience in the healthcare context. It is significant to emphasise that the research is conducted from the company perspective which means the research approaches gamification companies operating in healthcare-related context to explore their attitudes toward the user experience. In other word, the research is about the user experience but from the companies' point of view. The target of the exploration is totally in the companies' side.

In the defined scope of research presenting above, the different groups of affordances, the key elements characterised gamification solutions are examined, starting from the stimulation perspective, the interaction and lastly, sense-making one. They are the lens from which the research investigates the gamification solutions. Moreover, they reflect the gamification solution designers' expectation towards their products, users and the users' ecosystem in the scope of psychology and behaviour. From the reason mentioned above, the main research question raised below:

> *How can gamification improve user experience in the healthcare sector?*

Two sub-questions are identified to contribute to the main question:

> *In which way can gamified solutions impact users during their treatment?*

"What is the users' experience under the effect of the gamified solutions?"

The first sub-question aims at exploring gamification factors are utilised in the treatment solutions. It is evident that there are so many people like playing and willing to spend hours on games. The application of game elements into the serious contexts was expectedly beneficial to the users, and reality has been proving the success of this implementation in different domains. Therefore, it is time to discover the mechanism of gamified products to users who are under particular conditions of treatment care. The later one tries to figure out the scope of gamification influences on the users. To do so, the research examines the customer experience under the extended scales mentioned in detail in the theoretical framework and the methodology parts.

1.4 Research methodology

This research approaches the phenomenon deductively which means that the theoretical framework is generated before the data collection. However, in order to open an opportunity to the theory construction, inductive reasoning is also applied. In other words, the research is abduction-oriented to utilise both the deductive and inductive approach. As an initially deductive approach, the theoretical framework is built. The empirical data analysis provides quality insights which is not only testing the theoretical framework but also contribute and modify the theoretical structure.

The semi-structured interviews gather the primary data. Two companies are arranged to provide the answers for the data collection. The study focuses on the target group of CEO and leading designers who have a holistic view of gamified solution design. The semi-structured interview covers a list of questions generated under different themes. Those themes are all from the theory-based formation. Data analysis is carried out on the foundation of the analysis template.

1.5 Key concepts

The basic terms and concepts are identified to limit the scope of the research in this section. First, gamification is briefly mentioned before getting much closer to this concept in the theoretical part. Next, the user experience is clarified to avoid the confusion over the use of this term in the research. Last, the healthcare sector is defined in the way being scaled down into the scope of the ICOry project which is introduced later in the methodology chapter.

Gamification has been an emerging concept over the last few years both in the academic world and industry. The most commonly agreed definition amongst various proposed ones was from Sebastian Deterding. In short, gamification is the "*use of game elements in nongame contexts*" (Deterding et al., 2011). Non-game activities which mainly are physiotherapy for pre-surgery and rehabilitation in the context of this research, are gamified by utilised game designs and game mechanics. Game affordances which are considered the critical gamification strategy (Park & Bae, 2014) are also the target of this research' exploration. The term "affordances" is frequently used in this research inspired by the large-scaled and up-to-date review of the co-author Koivisto and Hamari in 2019. Game affordances are implemented for gamifying activity or service, stimulating the expected experience from the users or customers. The terms "game elements" and "game mechanics" are also used in this research with similar meaning.

Second, the user experience is the other vital concepts of this research. User experience is either the customer experience when they use the paid-healthcare gamified services or the patient experience in public hospitals. Different beneficiaries need considering when the gamification companies design the healthcare solutions, and their outcome is understood the user experience in this research. The user experience is sometimes replaceable by the term "outcome", for example, the psychological outcomes or behavioural outcomes. The user experience formed by gamified healthcare solutions in this research is examined under stimulus-based, interaction-based and sense-making based (Lipkin, 2016).

The context of healthcare in this research is also considered the orthopaedic and paediatric treatment in general. It can be the physiotherapy, surgery, therapy or rehabilitation. The scale of the healthcare context is the ICOry project' context in which the focus is on the patient-centric solution for orthopaedic and paediatric surgery. The details of the ICOry project is presented in the research methodology part.

1.6 Structure of the study

The introduction presents the whole general picture of the research. In this part, the objective of the research is introduced as above. The theoretical framework is built in the second chapter and empowered by the literature on gamification and customer experience to achieve this goal. The third chapter describes the research methodology used in the research including the qualitative research choice, the semi-structured collection method, the context of the ICOry project leading to that decision-making in the research methodology, and the data analysis process. The fourth chapter is findings and discussion showing all the empirical data and discussing the collected data. In the fifth chapter, the findings of the study are presented and summarised. In the last chapter, the study gives the conclusions by figuring the differences between the results with the preliminary framework and, more importantly, answering the research questions. The theoretical contributions and managerial implications are also presented in the conclusion. The conclusion also indicates the limitations of the research from which the suggestions for further research are suggested. The reference list and appendices are allocated in the last pages.

2. THEORETICAL BACKGROUND

In this chapter, the overview of the gamification is introduced starting by its definitions and conceptualisation, following by the presence of gamification in the body of literature and gamification in the healthcare context. The literature review of the gamification is closed by the conclusion why gamification can be considered a promising solution in the healthcare sector. The second central part of this theoretical background is about the customer experience covering the most significant milestones

2.1 Gamification

2.1.1 Gamification's definitions and conceptualisation

First used in 2008 in a blog post, gamification has been a popular topic and a mean of supporting users' engagement or enhancing their positive patterns. That is why it attracted the industry's attention quickly. The term "gamification" was described in that post as "*taking game mechanics and applying them to other web properties to increase engagement*" (Terril, 2008). Gamification has only more than a-decade-old, and its presence in academia is even shorter. Until 2012, there are only two definitions (Huotari & Hamari, 2012). One is from Deterding et al. (2011) which described gamification "*as the use of game design elements in non-game contexts*". The second one was from the co-author above in their effort to anchor gamification to the knowledge's body of existing service marketing literature. Under this context, gamification is considered as "*a process of enhancing a service with affordances for gameful experiences in order to support user's overall value creation*." (Huotari & Hamari, 2012). This definition emphases on the goal of gamification which is adhered to the co-value creation of the dominant service logic instead of focusing on the systemic perspective as that of the first one. Two years later, these co-authors not only broadened their definition for general context but also emphasised the significance of the gameful experience. The motivational affordances of the

gamification process are first to provoke gameful experience, then further behavioural outcomes.

The 2012' definition from Huotari and Hamari above is considered a better match to today's service landscape in which customer is much more decisive and powerful. According to this definition, the concept of gameful experience is remarkably significant from which the value can be generated. In non-game context, gameful experience refers to *"the positive emotional and involving qualities of using a gamified application*" (Eppmann et al., 2018). If the gamification is about the gameful experience, then the success of the gamification should be measured by a gameful experience scale. However, it is seemingly that currently the accomplishment of gamification has frequently been measured through sales figures (Huotari & Hamari, 2012). Under this context, the gamification designers have to face the conflicts between sales or marketing-oriented purposes and valuable experience creation. The value created by gameful experience partly emerges from the voluntary and intrinsic motivation of the players. Once the designers try to direct customers' decision making, they do not head to the core of gameful experience anymore.

Hamari et al., (2014) depict that three main elements are building up gamification: the affordances, the psychological outcomes and the behavioural outcomes. The current research remains stable with this conceptualisation of the gamification. There have been continuous efforts from the scholars, especially recent years on digging deeper into these three aspects of gamification.

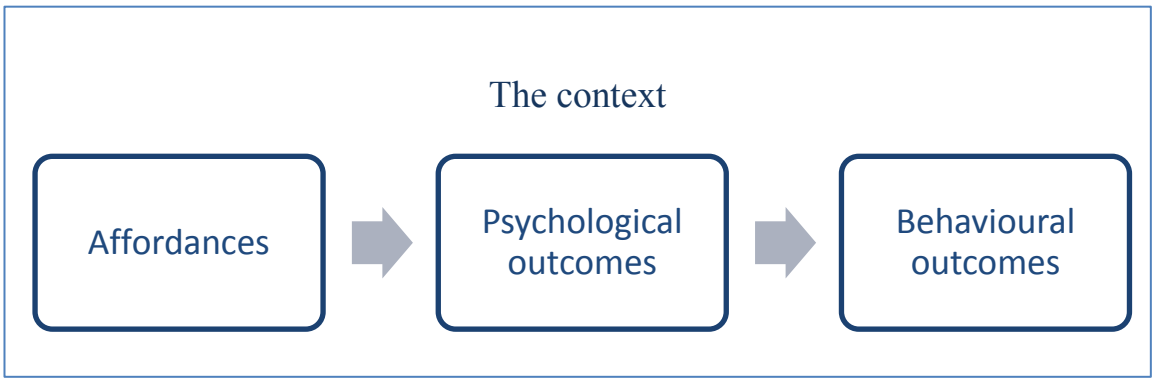


Figure 1: Overall conceptualisation of gamification (Koivisto & Hamari, 2019) (Following Hamari et al., (2014); Huotari & Hamari, (2017) and Deterding, (2015).

The first and the most crucial element whose roles is stimulus the gameful experience is the affordances. The affordances "*refer to the various elements and mechanics that structure games and add in inducing gameful experiences within the systems*" (Koivisto & Hamari, 2019). They are implemented to the services as the stimulus to generate the psychological outcomes, then the behavioural outcomes. Until now, it is estimated to have forty-seven affordances presented in the studies among different domains (Koivisto & Hamari, 2019). Although these affordances are various, in total, they are divided into five groups: achievement/progression-oriented, social-oriented, immersion-oriented, real world-related and miscellaneous elements. The achievement/progression affordances are the most common choices to gamify activities. In particular, points, leader boards and badges are the most common options used and researched. The reasons for this prevalence are that employing such these affordances without further consideration of the context or the users leads to the mere "pointsification" of the activities. Besides, inserting them as an additional layer to an existing system can be achieved without undue effort (Mekler et al., 2015); and the designers follow the pattern-based perspective to approach to the gamification design guides and frameworks (Seffah & Taleb, 2012). The second most interested group of affordances is social elements. Some popular features in social network service such as friend-making, community-linking, status-updating, commenting or profiles' information-sharing are applied as gamification features. Among different social element listed, cooperation and team-based activities are the priorities. The third group of affordances is immersion-oriented elements such as stories and narratives, avatars or virtual worlds. These are not as frequently applied like those of achievement and social affordances. Until now, the triad of points, achievement and leader boards which are called the gold metric remains dominant in the whole picture of gamification (Koivisto & Hamari, 2019).

It is significant to note that the categorisation of the affordances based on how the authors of the papers referred. It is acknowledged that there are relatively overlapping between those affordances. In other words, some affordances are

somehow similar. For instance, in terms of displaying, showing points is much close to exposing progress bar; or completing the missions is inherently similar to achievement. However, it is supportive of the overall view of what the gamification affordances are. That is why the research does not try to dig deeper into the similarity and difference between them. Moreover, the categorisation does not affect the analysis later on.

Affordances				
Achievement/Progression	**Social**	**Immersion**	**Non-digital elements**	**Miscellaneous**
▪ Points, score, experience points ▪ Challenges, quests, missions, tasks, clear goals ▪ Badges, achievements, medals, trophies ▪ Leaderboards, rankings ▪ Levels ▪ Performance stats (includes visualisation of agreement in crowdsourcing), performance feedback ▪ Progress, status bars, skill trees ▪ Quizzes, questions ▪ Timer, speed ▪ Increasing difficulty ▪ In-game rewards	▪ Social networking features ▪ Cooperation, teams ▪ Competition ▪ Peer-rating, also betting to review the work of others ▪ Customisation, personalisation ▪ Multiplayer ▪ Collective voting	▪ Avatar, character, virtual identity ▪ Narrative, narration, storytelling, dialogues, theme ▪ The virtual world, 3D world, the game world ▪ Roleplay	▪ Real world/ financial reward ▪ Check-ins, ▪ location data ▪ Motion tracking ▪ Physical cards ▪ Physical playboard ▪ Real world interactive objects ▪ Physical objects as game resources ▪ Physical dice	▪ Full game (also board games), also commercial gamification systems not described ▪ Assistance, virtual helpers ▪ Virtual currency ▪ Reminders (to create engagement), cues, notifications, annotations ▪ Retries, health, health points ▪ Onboarding (safe environment to practice the rules), benefits for beginners ▪ Adaptive difficulty ▪ Game rounds ▪ Warnings ▪ Penalties ▪ Game slogans ▪ Funny movies ▪ Virtual pets ▪ Trading ▪ Making suggestions ▪ Virtual objects as augmented reality

Table 1: Gamification affordances (Adapted from Koivisto & Hamari, 2019)

Psychological outcomes have been considered as the second element characterise gamification. "*The psychological outcomes refer to psychological experiences such as competence, autonomy and relatedness or the enjoyment and engagement*" (Koivisto & Hamari, 2019). Remarkably, the systematic paper from the co-author indicates that finding different types of psychological outcomes is not the priority but the way gamification implementations are perceived and experienced as systems. Many of them have been examining the perceptions of the use of gamification system, some specific feature of the systems, or some other assessments related to users' experiences. Thanks to these methods, the most typical psychological outcomes are pointed out which are enjoyment, the experience of fun and motivation (Koivisto & Hamari, 2019). Since gamification involves motivational information system design (Hamari, 2015), then it is understandable that motivation increase is also the popular psychological outcome. Some other aspects for instance perceived usefulness/effectiveness, the ease of use and effort to use gamification are particularly notable also. The category of different psychological outcomes listed in table 2 below. Compared to the original version presented in the review of Koivisto and Hamari (2019), there are some changes. Some of the psychological outcomes are reallocated to meet the context of this research. The re-allocation some psychological outcomes conducted based on the nature of them and does not change the basic categories.

Psychological outcomes				
Affective	**Cognitive**	**Effort in use / Experienced challenge**	**Attitude**	**Social interaction**
▪ Perceived enjoyment, fun ▪ Motivations (also orientation towards various motivations) ▪ Interest ▪ Engagement ▪ Affect, emotional experience ▪ Flow ▪ Playfulness ▪ Immersion ▪ Mood	▪ Perceived usefulness, perceived effectiveness ▪ Perceived competence ▪ Perceived control ▪ Perception of learning ▪ Perceptions of additional benefits, customer ROI ▪ Quality of life, flourishing ▪ Involvement, participation ▪ Perception of contribution ▪ Awareness ▪ Focus ▪ Identification	▪ Ease of use ▪ The effort, perceived difficulty, challenge ▪ Perceived stress, cognitive load ▪ Frustration, annoyance ▪ Workload ▪ Perceived physical exertion	▪ Satisfaction ▪ Autonomy ▪ Empowerment ▪ Attitude ▪ Predisposition to change ▪ Comfort with sharing date ▪ Perception of one's work ▪ Self-efficacy, confidence ▪ Anxiety ▪ Vigilance ▪ Familiarity ▪ Loyalty ▪ Attentional bias	▪ Subjective norm, social influence ▪ Recognition ▪ Relatedness ▪ Reciprocity ▪ Network effects ▪ Perceived socialness, social context ▪ Perceived competition ▪ Social comparison ▪ Social skills

Table 2: Gamification psychological outcomes (Adapted from Koivisto & Hamari, 2019)

Behavioural outcomes		
Performance	**Social interaction**	**Miscellaneous**
▪ Speed, time ▪ Amount of contributions/content produced ▪ Course grade, assignment grade, academic performance ▪ Experience, points, score gained ▪ Quality of contributions ▪ Learning, skill progression ▪ Badges earned, tracking of badges ▪ Number of assignments, amount of contributions in class ▪ Number of attempts ▪ Accuracy ▪ Leader board positions ▪ Acting on time ▪ Number of transactions, number of trade proposals ▪ Energy use in exercise, the intensity of exercise ▪ Medication over/misuse	▪ Cooperation ▪ Social actions ▪ Word of mouth ▪ Requests for help ▪ Recommending intentions ▪ Size of the network, amount of friends ▪ Agreement over content	▪ Ecological behaviour ▪ Functionality of software ▪ Retention and attrition of users ▪ Disease knowledge ▪ Behaviour change ▪ Amount of problem ▪ Stress level ▪ Anxious behaviour ▪ Pain burden

Table 3: Gamification psychological and behavioural outcomes (Adapted from Koivisto & Hamari, 2019)

While the studies have examined the various number of psychological outcomes, the behavioural ones are more limited. The behavioural outcomes "refers to behaviours and activities of the users who are supported through the use of the gamification system" (Koivisto & Hamari, 2019). For example, users continue doing the physical activity in the scenario created by exercise gamification; or try to get better learning results in the scenario built by education gamification (Koivisto & Hamari, 2019). Similar to the former outcomes, the priority of scholars is not which the behavioural outcomes are but how the gamification system works to generate the behavioural outcome. Many of the empirical studies try to examine the interaction between users and the system including the performance metric. In the performance, a time-related variable such as time and speed are the most concerned. Also, the amount and quality of the contribution or the contents which are produced by the users in the interaction with the gamification system are frequently examined. As mentioned before, badges, points and leaderboards are the affordances often applied in gamification. Therefore, there is a considerable amount of research on performance related to points gained; badges earned or leaderboard position. Similarity, the number of papers on study-related behavioural outcomes reflects one of the most popular domains among all in gamification which is education and learning.

Different studies indicated the advantages of gamification. Gamification can positively affect the participants' emotional experiences, for example, promote curiosity, optimism and pride) (McGonigal, 2011, p.28). Gamification can help users not only persist through negative emotional experiences but also change them into positive ones (Lee & Hammer, 2011). The users' sense of identity and their social positioning can be enhanced by gamification, and their cognition is positively influenced by providing complex systems of rules for players to explore through active experimentation and discovery (Lee & Hammer, 2011). Moreover, gamification is designed to promote communication capability, judgment ability and social skills such as leadership or collaboration (Read & Shortell, 2011). The time the player spent one playing some entertainment games can also enhance psychomotor skills (Biddiss & Irwin, 2010; McConville & Virk, 2012).

2.1.2 Gamification in academic research

Regarding the context of the research, the range of it in which the studies were performed is relatively wide. However, according to Hamari et al. (2014), education and learning were the most popular ones for the applications of gamification. Whereas, there is only one study explicitly conducted in healthcare. Their research showed the fact that there is still much pace for further studies in healthcare and the different context of implementations. A 2019's review from the co-author Koivisto and Hamari (2019) record the considerable progress of gamification research in various domains, especially in healthcare with forty empirical studies and fifteen non-empirical papers. Education and learning are still the most exciting domain as it was. Surprisingly, there are only nine papers including both empirical and non-empirical ones have been explicitly conducted in a marketing context. The other remarkable domains that can be mentioned are crowdsourcing, social behaviour/networking/sharing, software development/design, business/management ecological/environment behaviour, e-commerce/e-services, software engineering.

2.1.3 Gamification in the healthcare sector

Under the healthcare context, gamification provides the means to increase an individual's fun, engagement and compliance, while still accomplishing wellness and healthcare activities positively both in health a cost-outcome (Lenihan, 2012). Its applications in health-related context are escalating to promote wellness, reduce the potential threats from unhealthy and risky behaviours. Also, medical education and practice are witnessing the emergence of gamification (Pereira et al., 2014). It means such this approach is better-suited to gains more benefits for the industry. However, the number of studies, a systematic review from Graafland et al. (2012) calculated a total of 25 articles describing 30 games which are applied to train medical professionals, for instance, the surgical skills, or for educational purposes. Also, there are commercial games for developing essential skills which are relevant for medical purposes.

The potential impacts of gamification on health-related contexts are also examined. Pereira et al. (2014) indicated two cases. In the first one, the motivational affordances of gamification formulated by the technology-based solutions afford individuals to fulfil their own goals. It enables the transformation from obstacles to motivations which lead to behavioural changes. In details, gamification can be embedded in smartphone apps, video games or reality shows to support users individually to lose weight, change eating habits, do more exercise or promote hand hygiene. The second case, gamification is applied to a larger scaled a healthcare organisation in its operational processes such as diagnostics to treatment, administration to side effects, adherence obstacle to long-term care or education to training. Pereira et al. (2014) pointed out that the practice of medicine is often tedious, repetitive, boring, and even painful routines for both the examiners and patients. The integration of gamification enhances the engagement, productivity and collaboration of the health workers. Also, administrative professionals can increase performance and services for patients.

The benefits of gamification on users are demographically different. It is evident that so many children love games. They have been proving the high propensity towards games both in mental capabilities and physical skills. As long as they are motivated and inspired, they can achieve excellent results. Reality has been proving that they usually get high scores. They are also the most massive and most enthusiastic fan of game-like activities. However, a study conducted by the co-author Koivisto and Hamari (2014) indicates that age does not affect most of the benefits of gamification significantly directly. The only barrier is the ease of use diminishes through years which meant older adults face difficulties in experiencing gamification.

2.1.4 A promising solution for healthcare

Gamification which is considered as one of the prevailing trends offers both the scholars and practitioners a new approach to solving many current issues. The Statistics Portal (2017) announced that the gamification market's growth is estimated from nearly USD 5 billion in 2016 to nearly USD 12 billion in 2021. This sharp rise can partly prove the emergence of gamification on a global scale. In brief, the

application of gamification is to motivate and engage users. In other words, it brings more enjoyable and motivating experiences to the users by equipping them with different affordances. The expected results are psychological or/and behavioural outcomes. Studies have been continuously proved the positive effects of gamification application on healthcare-related activities and treatment. One of those positive psychological outcomes is the enjoyment which functions effectively on a less conscious, less cognitive and less direct level in determining use behaviours (Hamari & Koivisto, 2015). It is the less direct determining the users' behaviour that allows gamification to generate the enjoyment and the gameful experience naturally. This finding can partly explain why gamification services are referred to.

Based on the domains of the empirical research on gamification presented by Koivisto and Hamari (2019), it is evident that gamification tends to be implemented primarily in domains in which long-term commitment and perseverance are required for gaining results, for example, learning, the development of healthy, or beneficial habits. Gamification system features hedonic design aiming at making the use of services or products enjoyable from which the chances of engaging with it in long-term are possibly increased. The application of gamification also increases the reach of the health interventions of those who are hard to approach by the standard treatment (Pereira et al., 2014).

2.2 Customer experience

In this part, different topic-related aspects of customer experience are reviewed starting with the non-stop efforts to answer what the customer experience, its changes through time, and its description in the body of research. What the proper perspective and lens should the customer experience formation places on is the second question. Among different theoretical foundation, it is crucial to decide the approach that best suits the context of the project and today' service settings. Customer experience is also narrowed down into the healthcare context, trying to figure out the unusual angles and the related issues which are possibly solved by gamification. Repeatedly, the customer experience mentioned in this part means the service users experience or the patients' experience.

2.2.1 Customer experience's milestones

The different definitions or view of the customer experience through time have anchored different milestones in the literature review body. The pioneering article of experience is from Holbrook and Hirschman (1982). They introduced the concept of experience in the field of consumption and marketing which is called consumption experience. It was the early of the 2000s that Carú and Cova (2003) presented a consumption view to experience which is the more profound definition of experience outside and inside marketing science. According to them, the consumption experience 'is no longer limited to some pre-purchase activity" but spread over time in which the customers go through four major stages: the pre-consumption experience, the purchase experience, the core consumption experience, and the remembered consumption experience/the nostalgia experience. The customer experience was more emphasised as the consequence of the higher customer role. The customers – sellers, are not merely transactional anymore. The concept of common experience which "corresponds to everyday life, routine, the past, and the passive acceptance of events"; the extraordinary experience which "corresponds to more intense, framed and stylized practices"; and the social context of consumption experience were profoundly examined. This definition is much about the role of the suppliers that actively propose the value while customers are much more passively perceived the values. It did not take so long time that the scholars reached next milestones in which experience as an outcome of customer integration. Meyer and Schwager (2007) study concluded experience as an outcome of customer integration the internal and subjective response of customers to direct or indirect contact with the company. With a holistic view to customer experience, Verhoef et al. (2009) suggested a conceptual model in which customer experience management strategy consists of the social environment, service interface, brand and earlier customer experience, which leads to total customer experience (cognitive, affective, social, physical). It is evident that the role of the customers is highly appreciated and significantly, the context where customer experiences are generated is much broader than it was. It is not only captured the interactive sphere anymore. The Meyer and Schwager (2007) and Verhoef et al. (2009)'s view of customer experience more or less is influenced by the significant lens introduced by Vargo and Lusch (2004)

which is service-dominant logic. Under the service-dominant logic perspective, customer experience raised the customer role into a higher level. The service suppliers have to try, not for the quality of their products or services, but the co-creation of the customer. It is the co-creation that support the development of outstanding perfect customer experience. Literature body of service marketing recorded the big leap. Service-dominant logic has been contributing theoretically and empirically. Once customers become the service co-creator.

The latest perspective experience is customer-dominant logic. Explaining for the rise of this logic is the technological advancement (Rust and Huang, 2014) and the emergence of the individual (Van Doorn et al., 2010). They empower customers shaping today's service landscape in the way that the customers and their activities significantly influence service provision and market competition. Customer experience and activities are linked. Experience arises from different types of activities, not only interaction with a service provider, but also everyday activities (Heinonen et al., 2010). In other words, customer-dominant logic focuses on how customers embed and experience service in their everyday lives and how the provider can be present in these experiences (Heinonen and Strandvik, 2015). The customers are either active or passive. They have the independence role in orchestrating their activities and experience. They control the game. In terms of the scope, customer experience is formed within the service-ecosystem in the provider-dominant logic view, while it has emerged in customers' ecosystem in the customer-dominant logic. Also, under the provider-dominant logic, the experience is extraordinary and exceptional. Whereas, customer-dominant logic considered experience is mundane and every day also (Heinonen et al., 2010).

As a consequence, the fresh challenge is posted. If the customer experience is not restricted to service relationship, how the service supplier could improve customer experience which is continuously and daily emerging in the customers' own-created system. This is a challenging question to answer because once customer's roles are ultimately decisive, it is harder for both academia and industry to access easily into the customer experience arena. Instead, they have to discover the potential, unrealised value of a service. It is advisable to investigate what processes customers

are involved within their own context: what different types of physical and mental input they need to support those processes. This means setting out from the understanding of customers' activities and then supporting those activities, rather than starting from products/services and then identifying the activities that the business can fit in.

When applying a customer-ecosystem lens, customer experience emerges through customers' actions and processes in customers' ecosystems (Lipkin, 2016). So, it is crucial to understand what the customer ecosystem is. It is a "system of actors and elements related to the customer that is relevant in a specific service" (Voima et al., 2011, p. 1015) and can include "service providers, other customers (individuals and firms), other actors, and the physical and virtual structures related to the service" (Heinonen & Strandvik, 2015). The customer's role then becomes to invite other actors to participate in his/her customer experience formation activities, whereas the firm's and other actors' roles are to support the customer in achieving their goals. A considerable frame is applied to the contextual dimensions because the customer can build their own system and actively invite other actors to join their system in the experience formation. So, the customer experience formation occurs in provider and customer worlds and in the intersection between the two, known as the interactive service context (Heinonen & Strandvik, 2015). Furthermore, it is not only direct experience but also related, even unrelated experience is formed.

2.2.2 Significances and challenges

Customer experience has been considering the critical research priority in service and marketing research and marketing literature (Jaakkola et al., 2015; McColl-Kennedy et al., 2015). Schmitt (1999) is one of the pioneering scholars who emphasised the significance of customer experience. While Pine and Gilmore (1998, p. 3) especially point out the importance of experiences the modern world and the profitable opportunities from bringing good experience to the customer. Many services place the customer experience at the core of the service offering (Zomerdijk & Voss, 2010). However, Marketing, particularly customer management, has been slow to approach this progress in the marketing literature (Lemon & Verhoef, 2016).

Besides the significant attempts to understand the customer experience, there are real challenges. The first one is that organisations do not merely deliver experiences for customers (McColl-Kennedy et al., 2015). The experience is inexorably linked with the value obtained as perceived by the individuals (Helkkula et al., 2012). That is why Vargo and Lusch (2008) state that customer experiences are uniquely and contextually interpreted which emerge whether an organisation wants to recognise and influence it or not. Second, customer experience requires consecutive exploration (Lipkin, 2016) due to its subjective complexity and the research fragmentation. Besides, the focus is much more on managerial actions and outcomes than the theories underlying the antecedents (McColl-Kennedy et al., 2015).

Moreover, scholars have been continuously stating that meaningful customer experience plays a pivotal role in engendering increased customer satisfaction, loyalty, substantial revenue (Klaus & Maklan, 2012) and essentially forming the fundamental premise of all business (Helkkula, 2011). Therefore, the investments in customer experience strategies are significant as the way to remain competitive in a rapidly evolving service landscape (Ostrom et al., 2015). To do so, a deep understanding of customer formation is initially needed.

That is the reason there are the calls for more research, especially on the customer experience formation. It is essential to acknowledge the concept as complex as customer experience from what constitutes it.

2.2.3 Customer experience formation

What the researchers have defined customer experience formation as a multifaceted phenomenon, taking place through individual, internal processes (Sandström et al., 2008), and observable, contextual events (Verhoef et al., 2009). Many recent papers even move further into this phenomenon by examining the collaborative co-creation (Frow & Payne, 2007) or instrumental creation (Meyer & Schwager, 2007) or the initial rise of customer experience (Heinonen et al., 2013). Diverse approaches to customer experience formation have been introducing by researchers; still, it

necessary to have a systematic review over these and the theoretical underpinning them.

According to Lipkin (2016), at the individual level, customer experience formation is approached by three perspectives.

Stimulus-based perspective is traditionally applied by the service researchers to explain customer experience formation (Zeithaml et al., 1996) by concentrating on external stimuli, responses, and perception. Researchers have kept approaching this view stand in service design and management literature (Lipkin, 2016). The stimulus-organism-response (S-O-R) model and the generic sensation perception framework which are derived from environmental and behavioural psychology and psychophysics are often applied under these external stimuli. The first model introduced by Mehrabian and Russell (1974) recommends that environmental stimuli impact the individua's cognitive and affective conditions, thus influencing behaviour. Similarly, the second framework presented in 1966 by Fechner is about the affected of externally stimulated sensations on internal perceptions motivating the individuals to take actions. To conclude, external factors created by service providers play a significant role in stimulating the customer experience. These external environmental stimuli factors can be the atmosphere, spatial layout, signs, symbols, or artefacts. They create the servicescape. In terms of the role of the customer, it is incredibly passive. In details, the stimulus-based perspective conceptualises the customer experience as "*a comprising subjective and internal response*" (Meyer and Schwager, 2007) to service components created by the service providers.

The interaction-based perspective was approached in the early 2000s as an extension of the stimulus-based attitude which does not figure out the significance of the social interactions and individual processes (Lipkin, 2016). Interaction – the based view is partly from environmental and behavioural psychology and psychophysics as the stimulus-based perspective and also from elements found in the dialogic paradigm (Clark & Brennan, 1991) and hermeneutics (Bleicher, 1980). In terms of the dialogic principle, its focus is on "the explanatory and dialogical aspects of consumption which are deeply rooted in the social reality of consciousness,

reflection, and interaction and closely linked to human activities" (Tronvoll et al., 2011). While, the individual's interpretation of events is the core of hermeneutics (Pollio et al., 1997). That is why the interactions, processes, and interpretation are the centre of this approach. Customer experience is upgraded to a higher level. It is not only defined as "*subjective and internal responses to"* but also *"interactions with"* (Jorge et al., 2012) the service providers. It means the customers are not the passive receivers anymore but an active contributor (Pareigis et al., 2012). Service providers can continue building up the servicescape. However, it is not the decisive but supportive factor to generate the customer experience which is formed beyond the scope of servicescape. A new interaction-focused context, which is so-called the experience room, is more significant than servicescape is taken into consideration.

The sense-making-based perspective is now accepted by many scholars to build their studies on customer experience formation. This approach is considered more holistic and dynamic than the previous ones (Lipkin, 2016). The underpinning of this perspective is the theories on phenomenology (Lipkin, 2016). Phenomenology takes into account the way the individuals subjectively experience their lifeworld. They also try to make sense of the individual and social reality through experimental transportation in the timescale. Consequently, the centre of this approach is lifeworld, inner realism and circular sense-making. The customer experience, thus, is created in a phenomenological lifeworld context (McColl-Kennedy et al., 2015) in which the actors are actively involved. The actively mental processes and actions of the actors are more concerned than the external factors (Heinonen et al., 2013). Helkkula et al. (2012) add customer experience to emerge through an "iterative circular process of individual, and collective customer sense-making". Due to the circular sense-making mechanism, the customer experience formation is continuous and highly dynamic. It is evident that, while the second approach develops the first one, this third principle is much in contract with both previous perspectives. Its focus is on the actor's active and significant role in the experience formation. Sense-making-based studies often go along with customer-ecosystem view (Lipkin, 2016). It is not surprising because both of them are much about the customer – dominant logic.

2.2.4 Customer experience in healthcare

Health care organisations have been developing distinct practices to manage complexity, diversity, intangibility, and co-production to customise care and improve patient satisfaction and service quality. The lingering influences of patient satisfaction and service quality are hugely significant in healthcare because illness usually unfolds over time. It demands the patients not only adhere to the treatment but also engage in various follow-up activities. Providing a positive experience for patients possibly let them get the best treatment results (Sofaer & Firminger, 2005).

Healthcare delivery is irreducibly complicated because the human disease is genetically complex and may manifest itself uniquely from patients to patients (Vogus & McClelland, 2015). Even when the diagnosis is visible, the best approach is still the big question. The demographic heterogeneity of patients intensifies the complexity (Sofaer & Firminger, 2005). Healthcare experts can implement the same assistance, but the experience of the patient probably different as a function of their contemporary condition. Consequently, high-quality care is highly customised care. It is based on an intimate and particular understanding of the patient. There is also extreme knowledge irregularity between provider and patient due to the highly educated, professionalised, and specialised healthcare workforce. The knowledge gap is often worsened by the emotionality and vulnerability. This situation usually happens to patients and their families since they have to cope with health problems and managing complex disease processes (Dempsey et al., 2014). Providers are also highly dependent on information from the individual patient. These conditions make the care delivery more tangible, often by engaging patients and their families in the co-production of the care. Co-producing care is mainly tricky though due to the medical history that has privileged the interests of the provider (Nembhard et al., 2009) over the interests and preferences of the patient.

Two additional and unique challenges in achieving high customer satisfaction and service quality:

The first ones are the potential consequences for the patient, and the healthcare organisation are qualitatively different. The cost of failure is much higher in terms of patient injury and some cases death (Sofaer & Firminger, 2005). Second, care delivery may disclose over a long time, and satisfaction with the care experience influences patients' willingness to participate in their care and comply with the treatment plans. Both participation and compliance impact the subsequent health outcomes (Sofaer & Firminger, 2005).

The severe conditions in healthcare delivery have led the organisations to adopt and implement specific practices to ensure a high-quality patient experience by carefully customising and tailoring care to patients' unique needs. To address the high complication and diversity of patients and their conditions, healthcare providers applied practices like relational work systems to ensure cross-boundary collaboration (Gittell et al., 2010), and cultural fitness (Weech-Maldonado et al., 2012) to provide tailored care to diverse populations. Relatedly, there has been an industry-wide determination to build a better, more actionable, and unbiased set of measurements for a patient experience which is called the Consumer Assessment of Healthcare Providers and Systems - CAHPS (Elliott et al., 2009). This tool provides multiple forms of suffering that characterise care delivery for patients (Dempsey et al., 2014). Healthcare organisations have also upgraded beyond concern for the customer to implement specific compassion practices to make the care process more tangible and increase the amount, clarity, empathy, and quality of communication with patients (Lown et al., 2011). Lastly, some healthcare organisations have taken advantages of the macro-practices that essentially reorganise care through co-production known as patient-centred care (Rathert et al., 2013), or bedside reports (Gregory et al., 2014).

The complexity and intangibility of healthcare distribution require healthcare organisations to be co-production. This move ensures that they have contextualised information to deliver high-quality care. Though, there are traditional obstacles to co-production. One of them is the fact that care delivery has historically been provider-centred rather than patient-centred. Patient-centred healthcare organisations also incorporate patients and their families in three specific ways to advance satisfaction and service quality (Vagus & McClelland, 2015). Still, there have been substantial

innovations in patient-centred care (Rathert et al., 2013). These efforts boost more excellent and more effective communication between patients and their families with healthcare experts. Also, patients are progressively incorporated into medical training conducted in the way that patients share their issues and interact straight with the care providers through a programs so-called patient family advisory. There has been gradual growth in initiatives to include patients and their families to guarantee sustainable co-production (Schwappach, 2010). These efforts intend to capitalise on the fact that patients are the only individuals physically present during every consultation and treatment (Schwappach, 2010). They have valued insights, contextualised knowledge and are highly motivated to cut down on the risk of harm and guarantee positive outcomes (Lyons, 2007).

Healthcare organisations have employed hourly rounding checking purposely and proactively on patients to meet the patients' basic needs, for instance, going to the bathroom, positioning or controlling pain (Mitchell et al., 2014). These efforts are to meet expectations for high-class and timely care. Remarkably, hourly rounding is proposed to cope with the uncertainty which is inherently provoked during the treatment. Patients usually fear that their needs are not able to be responded on time. This concern leads to the anxiety and engagement in inappropriate coping reactions pressing the call button for additional issues (Mitchell et al., 2014). Halm et al. (2006) figure out that hourly rounding reduced call light use and increased patient satisfaction. This fact proves that proactive and useful digital tools for integrated communication between patients and healthcare professionals can reduce a considerable amount of anxiety for patients and time for healthcare professionals.

2.3 Gamified services improve customer experience in healthcare

Building a healthcare solution based on gamification approach is a multidisciplinary effort in computer engineering, usability, interface design, marketing, and psychology, among others. The wide range of fields poses significant challenges for design teams. It demands them to have a broad knowledge of each of these disciplines. That is why this research tries to approach the gamification service

providers to get to know how they can solve a set of problems of such those fields as mentioned above.

For this purpose, the research will define how the different groups of affordances can impact customer experience in three perspectives, starting from the stimulation, to interaction, then sense-making one. Regarding the stimulus of gameful experience, there are three over five groups of affordances are chosen because the focus of this research is on the digital gamification solutions only. Achievement/progression, social and immersion are also the most frequent group of affordances practically applied and empirically studied. Last but not least, the research tries to figure out what the psychological and behavioural outcomes are as the way users experience the gamification systems.

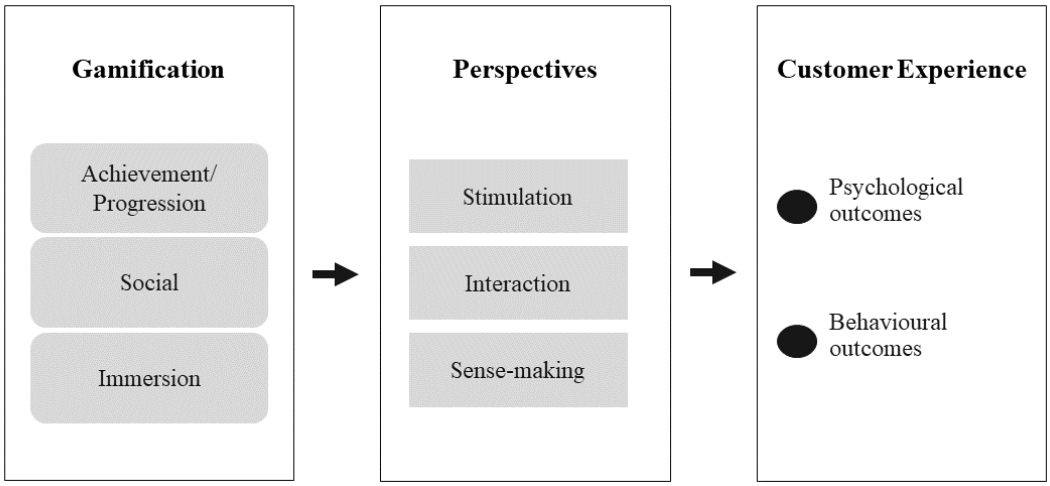


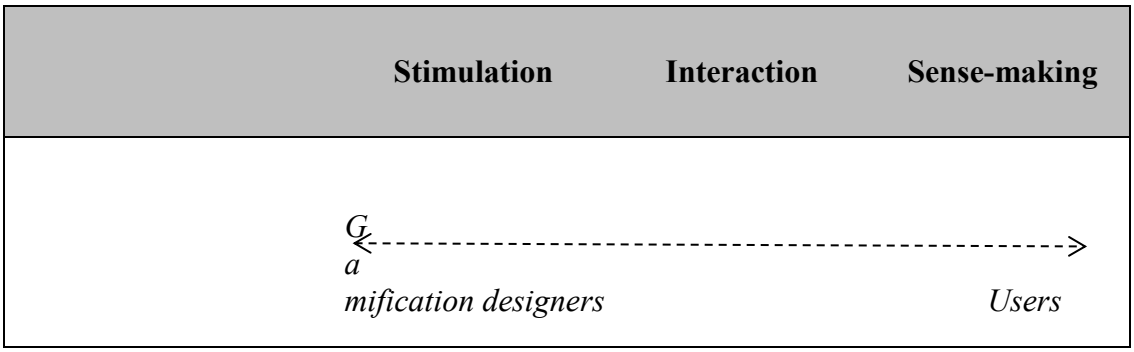
Figure 2: The structure of the research

The simulation perspective focuses much on the supplier side and their gamification solution, especially the gamification system design and designer expectations. In details, the affordances choice is considered as a critical issue to generate gameful experience. It is predicted that the customer experience is psychological-dominant. This is also the most desirable outcomes of gamification designers. Notably, the affective-related elements are unreplaceable psychological outcomes.

The interactive view provides a more extended scale in which both suppliers and users' view toward the gamification system are examined. In the suppliers' side, the stimuli are still the crucial factors. However, they have to consider more about the users' responses to those stimuli in particular and to in the gamification system in general. In the customer side, they have their own experience formed during the interaction with the system. Especially when the gamification system is in use, it is not only the primary emotions such as enjoyment, fun or engagement but also the attitude of satisfaction and predisposition to changes. In a higher cognitive level, they can perceive the usefulness of using the system or perceive the additional benefit brought by the solution. Besides those psychological outcomes, the

The most complicated perspective is the sense-making one. Once the users try to make sense of using the system, many criteria are included in that sense-making process. Any factors belonging to their background or their externalities possibly impact the outcomes. Of course, there are still psychological and behavioural outcomes formed by using the gamification system, but to what extent they are and how varied from user to user.

These three angles require different approaches. If the first perspective provokes the examination on the stimuli factors, the second view requires the research on the interaction between users and the gamification, and the last perspective leads to the influencing criteria which shape the experience of the users.



Progress/Achievement	• Affective	• Affective • Cognitive • Attitude	• Affective • Cognitive • Attitude • Experienced challenge • Social interaction • Performance • Miscellaneous
Social	• Affective	• Affective • Social interaction • Attitude	
Immersion	• Affective • Experienced challenge	• Affective • Attitude • Performance	
	Psychological-dominant outcomes	*Psychological and behavioural outcomes*	*Unpredicted outcomes*

Table 4: The preliminary analytical framework of gamification outcomes under different perspectives

The psychological and behavioural outcomes are as customer experience result from examining gamification affordances under different perspectives. When applying the stimulus view, it is predicted that different gamification affordance could bring a quite similar psychological outcome. The interaction perspective is possibly brought both psychological and behavioural results, and these consequences are predictable. Unfortunately, due to the complicated of the customers' background and the various externalities which are from a massive scale of the sense-making base, the outcomes are unpredictable.

3. RESEARCH METHODOLOGY

In this chapter, all the research approaches and methods implemented in the study are sequentially introduced. The first part is the explanation of the methodology chosen; then the second and third ones are the description of the data collecting and processing method.

3.1 Methodology choice

"Just as deduction entails an element of induction, the inductive process is like to entail a modicum of deduction."

(Bryman & Bell, 2007, p. 14)

The research aims at figuring out how gamification can affect the customer experience in the healthcare sector which is the research gap. As such, qualitative research, mainly, exploratory research is applied to discover and explore this phenomenon (Myers, 2013, p. 252). Exploratory research "tends to tackle new problems on which little or no previous research has been done" (Brown, 2004, p.43). As the name implies, this exploratory research intends primarily to explore the research questions; in other words, determine the nature of the application of gamification in customer behaviour influences. Also, the theoretical framework developed in the previous part needs testing. Therefore, the abductive approach which means both deductive and inductive reasoning are utilised.

Regarding the deductive reasoning, the research proposes the framework in which there are predictions of the psychological and behavioural outcomes. From testing those outcomes, the research can either confirm the framework or answer to the research question. While the inductive reasoning opens the possibility to develop or even change the theoretical framework as the result of the data analysis (Myers, 2013, p.13). Remarkably, the theoretical framework consists of the preconceptions which need testing and developing according to the findings from the data collection.

Therefore, adopting the abductive approach enables to "gain a fuller picture of what happening" (Myers, 2013, p.9). Besides, Dubois and Gadde (2002) indicate that the logic of abductive is useful than just use of the pure inductive or deductive approach. It is worth to note that the deductive strategy is usually associated with a quantitative search approach. Whereas, the inductive strategy of linking data and theory is typically associated with a qualitative research approach. However, Myers (2013, p.23) states that both inductive and deductive reasoning can be applied in qualitative research.

3.2 Data collection method

"Qualitative interviews are like night goggles permitting us to see that which is not ordinarily on view and examine that which looked at but seldom seen."

(Rubin & Rubin, 2005, p. viii)

Among several diverse research methods that differ from each other considerably, the qualitative interview is chosen due to the high interest in the interviewees' viewpoints about their gamification solutions.

The semi-structured interview is applied as the primary data collection method in this research. The questions are pre-formulated but no strict adherence to them. The list of questions the role of the interview guide, leaving a great deal of leeway for the interviewee in how to reply (Bryan & Bell, 2007, p.474). Also, the semi-structured interview provides the interviewees with the chances to add significant insights when they arise during the conversation. The research investigator can also raise more questions that are not prepared in the list as the interviewer picks up on things said by interviewees. In general, the first group of questions aims have the overview and the attitudes of the interviewees toward gamification. In short, the questions were designed for understanding their existing gamified solutions. The second groups are for examining the gamified system under three perspectives. For stimulation lens, the expected findings are the applied affordances, their effectiveness in trigger the user experience, the expected experience for the users. The questions take advantage of

the interaction lens to examine the user experience from interacting with the system and with the other users who are also using the gamified solution. The sense-making base leaves the room for questions relates to the actors, actions and resources in the user ecosystem. The last group of questions is to make sure there are no significant insights missed.

The semi-structured interview is more flexible and advantage than a structured interview and unstructured ones. Still, there are some potentials problems need considering minimising the unexpected risks. The possible difficulties and problems can be lack of trust as the interviewee is a stranger; lack of time which means that data gathering can be incomplete; elite bias comes from doing the interview with the high-status people in an organisation resulting in failing to gain an understanding of the broader situation; Hawthorne effects happened when the interviewer is not an invisible, neutral entity but become a part of the interactions and influence the interactions. During the interview, the communication is not merely in the way the interviewer just soaking up data, and the interviewees share the information. The interviewer also constructs the knowledge actively due to their research angles. Consequences, the interviewee construct the story in the way they reflect on an issue that they have never consider so explicitly before (Myers and Newman, 2007). One more frequent problem is the ambiguity of language. This issue not only happens for people from different language countries but also for those who are native. The meaning of the interviewer' words is often ambiguous. Also, the interviewees do not always understand the questions.

The dramaturgical interview technique suggested by Gubrium & Holstein (2002, pp. 3-32) and supported by Hermanns (2004, pp. 209-213) is implemented to overcome these potential difficulties. Overall, the interview is as the drama in which there are the stage, props, actors, an audience, a script, an entry, and an exit. The various dramaturgical concepts applied to the qualitative interview (Myers, 2013, p. 126) and employed as the technique for this research's interview. Even though the interviews with the gamification companies are conducted online, this technique is still applicable. In details, the whole interview is as the drama where the interviewer has to manage and direct the stage. It means, the purpose and the expected results are

presented. As the "stage director," the interviewer try to keep the interview under a reasonable amount of control.

The stage is considered the place where the interview is taken place. It includes backstage which is the informal activities and chatting happen before or after the interview (Myers & Newman, 2007, p.13). Usually, backstage activities are not well-concerned enough, but it plays warming up a step for the front stage performance of both the interviewer and interviewees.

The actors are both interviewer and interviewees. Dressing appropriately, being knowledgeable about the gamification companies and their products and conducting the interview in professional manners are well-prepared matters. Showing empathy, understanding and respect is also equipped attitude toward the interviewees and their solutions. The reviewer keeps in mind leaving enough space for the interviewee to share ideas and do not ask the question with the academic words which are hard for the interviewees to understand. For example, the word "affordances" is used in academic journal articles but not in all daily practice among gamification designers. Therefore, the interviewer tries to avoid using too vague words. If it is unavoidable, then there are some papers with the definitions and examples are prepared to make sure the interviewees understand precisely the meaning of the questions.

The audience roles are for both the interviewer and interviewees. In the interviewer' role, it is advisable that the researcher listens intently to the interviewees.

Because using the semi-structured interview, the script in which the list of questions designed from general ones to narrower ones is formed. There is not only the question list but also the opening (introducing the interviewer); the introduction (explain the purpose of the interview). Noticeably, the script is not so detail and over-prepared (Myers, 2013, p.129).

The entry is crucial because the first impression can dramatically affect the rest of the interview. The researcher tries to make the interviewees fell comfortable as soon

as possible and minimise social dissonance. Apply the instruction in the exit phase; the research conducts some critical issues. First is asking for the interviewees own ideas what are out of the given questions or the supplement of any already shared ideas. Second, the interviewer also asks permission to follow up, if needed. The research does not forget to ask for the recommendation of other potentials interviewees. This snowballing has been considered a useful one. However, this is just a back-up.

The empirically primary data are collected by the interview with the representatives from the gamification companies. There are three online interviews in total with the representatives from company 1 and company 2. The details about these gamification company and their solutions are presented in the following part - the introduction about the ICory projects.

Companies	Interviewees	Positions	Interview dates	Interview lengths
Company 1	Interviewee 1	CEO	09.04.2108	1 hour 5 minutes
	Interviewee 2	Game artist	09.04.2108	
Company 2	Interviewee 1	CEO	18.04.2018	30 minutes

Table 5: Interviewees' background information

The interviews were carried out on 9th April and 18th April. The interview with company 1 and company 2 lasted around 1 hour and half an hour long respectively.

They are all conducted online and in English. The outline of these interviews shown in Appendix 1. The questions in the outline formed based on the theoretical framework of the research. The few first questions are about the gamification solutions of the three companies in general. The goal of these general questions is to leave the room for the improvisation. After that, there are more specific questions belongs to three main themes: gamification-related questions, questions about the customer experience under three perspectives and the outcomes-related questions. From these questions, the interviewer tries to figure out the gamification affordance(s) applied by each company; their expectation of the psychological and behavioural outcomes in designing phase; the empirical outcomes from users in the application phase and the influences of other externalities related to the users' ecosystem on their experience.

All the interviews were on Skype and recorded by Skype' recording function. The video calls were immediately transcribed afterwards. Totally, there are 24 pages of empirical data were printed for the analysis.

3.3 ICOry project context

This thesis is conducted under the ICory project context which aims to build the next-generation patient-centric digital solution for orthopaedic and paediatric surgery. The ICory project focuses on intelligent, enabling patient journeys from pre-surgery to rehabilitation. The project specialises in the digital solution for orthopaedic surgery operations.

To do so, first, the eco-systemic business models are taken into account as the excellent and innovative foundations to build up the solution. Based on the cooperation of these multidisciplinary group of experts from Finland-based companies, hospitals, universities and research organisations in the ecosystem, the solution is created. Second, ICory provides the orthopaedic and paediatric patients with the surgery journey combined digital communication technologies, artificial intelligence, and robotics. The experience-centric co-design is approached to

transform all stages from the pre-surgery, during the surgery to the post-surgery. Wherever the patients geographically are - at home or in the hospital, and at which stages of the surgery process they are - the surgery preparation, the recovery or the rehabilitation, the anxieties, fears and pains are much-alleviated thanks to the playfulness and motivation from the gamification, robotics and combination of digital and face-to-face communication. Efficient communication is not only between the healthcare providers and the patients but also between service suppliers and the patients' owned-created system. The ICory's servicescape facilitates the continuous feedbacks, data collection and artificial intelligence to improve the patient experience during the whole surgery process.

This research is conducted in light of the project' context above. Regarding gamification, three companies as mentioned in the methodology choice providing different gamification solutions are the project's partners. The empirical data of this research are all from these companies' insights.

The first gamification solution is physiotherapy. Company 1 focuses on the physiotherapy gamified solution. The team is working on the first game. It includes a series of minigame starting with "Handcar Race" for children who are in physical rehabilitation and physiotherapy. This game focuses on feet injuries and after surgical treatment. The games are played at hospitals and remote environments. The advantage of this virtual training game is that it targets remote or home training. The games require the users to move because the users' body is the controller while the game environment is on the screen. Thanks to the motion detection camera, the moves of users are measured and displayed on the screen. The game does not only encourage the users to move their body and do required exercise but also measure the quality of the move. Based on that, it tracks the recovery process of the patients.

The second company which is allocated for the interview is a healthcare platform provider. The company aims at supporting the hospitals, clinics and patients with surgery-related issues such as patient adherence to treatment, late cancellations and no-shows, administrative work and care quality. By the healthcare platform provided healthcare professionals have tools to monitor patients and receive up-to-date health

information. Their extensive amount of time on communications and paperwork is also reduced due to the advanced communication functions embedded in the systems. Currently, company 2 is planning to implement gamification into their system. From the viewpoint of a company working with both Finnish healthcare organisations and international healthcare partners, it is expected that the interview with company 2' representative provides the research with significant insights.

3.4 Data analysis

In this section, the template of the data analysis is presented and justified. Then, there is the description of the analysis process in detail.

3.4.1 Data analysis method

The data-collecting method is qualitative means that the contents are from verbal expression. This non-standardised data need classifying into different categories. Also, the analysis is carried out by the conceptualisation (Saunders et al. 2013, p. 547).

3.4.2 Data analysis process

The process was carried out in three phases. First, three categories were formed basing on the theoretical framework allowing to rearrange the original data into analytical categories. The first main one is about the gamification affordances applied in the gamification solutions of the companies, the second category covers the companies' view under different perspectives, and the last one is the customer experience which is the outcome when children use the solutions. These categories were built both by consulting the theoretical framework and the data collected. However, the category is more concept-driven than data-driven. That is why the primary source to derive codes or labels is from terms used in the existing theoretical framework. The analysis temple is shown in appendix 2.

The second phase is to read carefully the all empirical data printed out into the papers to have the whole picture. After that, the labelling and coding were conducted with highlighters. NVivo can be utilised for this analysis due to the same mechanism. However, it is advisable that highlighting is more straightforward and more practical in this case with three interviews. The table of gamification affordances, psychological and behavioural outcomes were printed out also. A copy for each company to make sure there are no mistakes in labelling and coding. The third step is about coding and labelling using highlighters. The findings are displayed in different Excel sheets. Lastly, the data are classified into different groups according to three perspectives. The research tries to come up with systematic results for the findings.

4. FINDINGS AND DISCUSSION

The results derived from the data analysis are presented in this chapter. The findings' structure displayed based on the data analysis's formation which is also followed the conceptual framework in table 3.

The affordances are the first determinant mentioned in the chapter to come up to the relevant outcomes logically. Then, there is the discussion over the findings regarding the stimulation, interaction and sense-making perspectives. Lastly, the systemic summary of the psychological and the behavioural experience are presented

The empirical data are directly quoted as supporting evidence. Also, summary tables, figures are drawing up for the data illustrations.

From the findings introduced in the parts as mentioned above, one section about how the components of customer experience are produced in both desktop and mobile online environments, are presented. Lastly, the main observations regarding the cultural aspects that emerged from the data are presented at the end of this chapter.

4.1 The affordances applied in the gamification solutions

The affordances are not listed base on a game or a specific solution but the company's name. The reason is that a company might have different games or solutions. Alternatively, in only one game, there are various mini-games with different affordances. Also, some companies are on the pipeline building up their real games, expanding the scale of their own already-made games or even creating a new game. Therefore, it is not feasible to list by games. More crucial, the analysis and results are not affected by this division.

Besides the verbal description, the interviewees also displayed how to play their existing games. It was much easier this way to see what the affordances are applied in their gamified solutions.

4.1.1 Achievement/Progression

Instead of the classical achievement affordance, which is the point, the variants of it are applied in the gamified solutions. The players earn diamonds when they try raising their hand and reaching the diamond on the way moving forward. The players can lose the diamond when their squats are not deep enough making their character' head hits the barrier. The players lose speed if they do not squat down. In contrast, they speed up by doing the bodyweight squats. Besides diamonds, badges or levels aiming at increasing difficulties of the game are already in the plan of the designers to develop the game. After the users finish a session, the performance stats are shown such as how many squats the players did in a certain amount of time.

> "Here is the way the gamification solution works, you lose the speed when you do not do the squat. The more diamonds you get, the slower you go basically. If you meet the gate, you need to go with a deeper squat. If you hit your head, you will lose five diamonds." (1st interview, interviewee 1, 9.4.2019)

> "We will have quite shortly the badges coming up, achievements, unlock achievement getting to the next levels. But for that, of course, we need to have the next level, meaning the next games, but they are coming up." (1st interview, interviewee 1, 9.4.2019).

> "Now we have the result here, 16 squats and 57 seconds." (1st interview, interviewee 1, 9.4.2019)

4.1.2 Social

Interestingly, findings reveal that the leader board which is an achievement-oriented affordance can also trigger the competition. The leader board is utilised to remind the kids of doing the physical therapy exercises or evokes the competitiveness to be at the same level as their peers. That is the reason why the leader board is mentioned in the social session instead of progress/achievement.

> "The important thing is that it will remind the kids, show the instructions, it would maybe have the leader board, or maybe it would have, you know, a reminder that Peter remembering Rita now is playing in level six. How about you? Hurry up!" (1st interview, interviewee 1, 9.4.2019)

4.1.3 Immersion

The avatar or virtual character is the foundation of one company's solution. The players control the virtual character on the screen by their body. The player' movements reflect on the virtual characters. In other words, the players issue the commands to the character by their movements, for instance, doing the squats for the order of speeding up.

> "So, we bring these exercises on the screen where the avatar and game characters, you control by your body, and basically to move forward in the road." (1st interview, interviewee 2, 9.4.2019)

The existing game already has the virtual world in which the player' journey is in the tunnel. They move forward by the mover rolling on the railway. The mover is fuelled by the squats. There is another virtual world created such as jungle, river, or even a sports arena. They are going to be created so that there is more context for movements or body gestures required from the players. The players can have more arm/shoulder exercises when they try to throw the ball, the bananas to the monkey among the river. More challenging, the sporting arena is in consideration for the various physical therapy exercises. In one session, the combination of exercises is required, for example doing the squats, paddling then running. In general, the idea is to motivate the patients to move their body doing more physical therapy exercises.

> "The Squat games that we have currently, we are polishing that one. The plan is to develop on top of that. Then expand the world, expand different tracks, and create different exercise as well." (1st interview, interviewee 2, 9.4.2019)

"We are going to be in the jungle, travel rivers and countries with the canoe man and that are going to be also all kinds of exercises like throwing something maybe a ball to a monkey, or there will be a fishing something and again doing many movements." (1st interview, interviewee 1, 9.4.2019)

"Like a stadium of 500 meters where you have 100 meters you do squatting, 30 meters you are paddling in the boat then again 100 hundred metres you are running, with different exercises in that session. And the game session would be from what we say 30 to 60 seconds." (1st interview, interviewee 2, 9.4.2019)

4.1.4 Summary of the affordances

The summary of all affordances shared by the interviewees finalises this section. Company 1 is working on their existing game. Diamonds, timer, speed and performance stats are already applied in this game. The game designer not only wants to polish it for the better user interface but also build up more mini-games. Those new games will provide the paediatrics children with more challenges, mission at different levels to complete. The kids can perceive to increasing difficulties, competition and comparison when they see their position in the leader board; gain more badges as the reward when they upgrade to a higher level, and experience the challenges in a different context with their virtual character in the various virtual world. These above game elements are fulfilled in all three groups of affordances.

Companies	**Affordances**		
	Achievement/Process	*Social*	*Immersion*
1st interview	Diamonds Badges Leader board Levels Performance stats Timer, speed	Leader board	Avatar Virtual world
2nd interview	Have not applied yet		

Table 6: The summary of affordances applied in the gamified solutions

4.2 The psychological experience as the first outcomes of gamification solutions

4.2.1 The affective

Even though it is not all the companies have a precise classification of the psychological or behavioural aspects of the outcomes. Their expected outcomes are mostly not out of these. The primary purpose of gamified the healthcare solution and the most frequent psychological outcome mentioned is fun. Practising with gamified systems or apps as playing games is much more excited than looking at the papers and trying to imitate every single physical therapy exercise in it.

> "We basically try to solve the problem of getting the paper with the instructions for the exercises which is most people agree it is pretty boring and how many have given up doing the exercises. We are trying to make that part fun." (1st interview, interviewee 2, 9.4.2019)

> "We want to make the training fun especially remote training at home with the laptop." (1st interview, interviewee 1, 9.4.2019)

4.2.2 Psychological states and traits

The empowerment and motivation are emphasised in the responses shown in the findings. Paediatric patients usually encounter fatigue and deconditioning mentally and physically throughout the treatments. That is why the patient empowerment is considered the core principle of patient-centred care and emphasised in the responses of the interviewees. Once the kids are empowered and motivated, there is a higher ability to affect their own health behaviour and health situation positively. The gamified healthcare solution creator's priority the motivation and empowerment.

These experiences are the cornerstone building the fighting spirit both physically and mentally.

> "We want to make the training fun, rewarding or even more empowering and measurable. (1st interview, interviewee 1, 9.4.2019)
>
> "At least one thing is clear that we really really want to concentrate on the empowerment." (1st interview, interviewee 1, 9.4.2019)
>
> "The second one is really important: How does the patient feel and what is the empowerment level." (1st interview, interviewee 1, 9.4.2019)
>
> "That why the psychological part is very important as well as the motivational part" (1st interview, interviewee 1, 9.4.2019)
>
> "It's actually mostly related to motivating patients during their recovery." (2nd interview, 18.4.2019)

4.2.3 Effort in use

The gamified solution designers try to put themselves in the kids' shoes. This is the reason why the ease of use is the top priories. They are not as in healthy conditions as other kids without any treatments. Finding reveals that the kids' physical conditions can also influence the experience negatively.

> "No, I did not do the exercise because it hurts." (1st interview, interviewee 1, 9.4.2019)

Despite how good the solutions are, paediatric patients are not able to play if the games are too difficult for them. Findings clearly show that the gamification designers do concern of the willingness to use or the intentions to continue using the gamification systems. If the games are too complicated or hard to play, users, especially the kids can give up easily, or they are not willing to continue playing.

> "According to the tests, not with physical therapists, but the test with the kids in the shopping malls with some sports facilities. What happened is that the tougher the game is, the less they want to play." (1st interview, interviewee 1, 9.4.2019)

One of the reasons which can cause the inconvenience for the players is wearable devices. That is why none of them is required to play the game. The paediatric patients' focus should be on the physiotherapy instead of being distracted by the wearable accessories. Their experience is probably affected by wearing a VR gear or smartwatch. Also, a specific room for treatment is considered counterproductive due to its technical complexity. The external sensor inherently installed in the devices such as smartphone or laptop is the optimised options now.

> "...when the new team started, I said that you know, you can change everything but these two things, it's going to be really really hard for you to change. First one is that we are not using any wearable sensors, but only external sensors, to keep it easy." (1st interview, interviewee 1, 9.4.2019)

> "...the most important thing we want to make this so easy. You don't need to put anything on top you, you don't have to tighten anything, you don't need to have more explanation, you don't need to have specific room for room scaled VR or you don't need to put the clumsy AR classes on or you don't need to watch through a mobile phone." (1st interview, interviewee 1, 9.4.2019)

4.2.4 Overall assessment

The general attitude of the use of the gamified system is mentioned as the significant factors to form a positive psychological experience. It is not only the experience of the challenge of each mini-game, each level but the general attitude of the players toward the gamified system. The way the gamified system communicates with the kids is highly supportive of the better experience of them. For example, user interface elements exist directly in the game world instructing the kids how to start, speed up, and get rewards as opposed to being allocated on top of the gameplay

screen. To generate those positive outcomes, game creators do highlight the pilot. This phase is mainly about how to get the users into the game.

> "Now, it is more about testing and analysing the willingness of playing these kinds of game, the levels of understanding the game mechanism, for example: how to start the game, how to end the game and the level of ability to play the game." (1st interview, interviewee 1, 9.4.2019)

4.2.5 Social interaction

The competition among the players is also indicated as one of the psychological experiences triggered by implemented the leader board. However, the designers are also aware of the counter productiveness in the psychological aspect. For instance, the implementation of the leader board can only motivate the top players while discouraging the top bottom-up ones. Alternatively, the reminders created by the gamification system possibly put more pressure on the patients. They would feel in the way that they are worse than the peer instead of feeling inspired to try better. In this way, the kids perceive the competition and the comparison with other players or other kids in the same hospital constructively.

> "It (the game) would maybe have the leader board, or maybe it would have a reminder that Peter, remembering Rita now is playing in level six. How about you? Hurry up!" (1st interview, interviewee 1, 9.4.2019)

> "We are thinking we do need the leader board and high scoreboard, but we try to make them in the way that everybody wins" (1st interview, interviewee 1, 9.4.2019)

> "So, it (the leader board) does not say that I'm not on the same level, but I should play more" (1st interview, interviewee 2, 9.4.2019)

4.2.6 Cognitive

It is deniable that how the kids perceive each mini-game, the whole system, the competitors in the game are critical. However, it is agreed that the way the kids see

themselves through the treatment pathway should not be underestimated. The kids' feelings about physical improvement are indicated in the findings. Their own reflection on the physical therapy gamified exercise can result in the stronger spirit of fighting even the treatment can be long-lasting. Pride can be varied. It may be about the quick recovery, the pain alleviation; or it is the ability to have more precise movement.

> "So, in that sense, we are looking into children having a better image of themselves, being motivated to play because emotionally they feel stronger, and they feel they are getting better by playing the game." (1st interview, interviewee 1, 9.4.2019)

Of course, it is not all about the positive outcomes which are from using the gamification. It is possible that the kids have some negative experience. However, when the gamification providers are still more under the research and development than implementation, then, there are the opportunities for further research to have a more in-depth investigation into the unexpected drawbacks of the gamified system.

4.3 The behavioural experience as the second outcomes of gamification solutions

4.3.1 Performance

The findings indicate that behavioural experiences firstly related to performance such as time and speed, the diamonds earned as presented in the affordances-related findings such as player cannot move forward if they do not squat, once they move, they can increase the speed, earn diamonds, upgrade into higher levels with more demanding tasks.

> "You lose the speed when you don't do the squats…. the next level will be harder, let the player move faster" (1st interview, interviewee 1, 9.4.2019)

The quality of the players' contribution which is related to their behavioural experience was also mentioned in the interview. It relates to the accuracy, improvement and the complexity of the exercise done by the players.

> "…were the exercises done right… were the movements done better and can he or she do multiple movements at the same time?" (1st interview, interviewee 1, 9.4.2019)

4.3.2 The engagement or interaction with the system

For those solutions which are under the plan to implement gamification into the whole system, the engagement is the significant emphasis. There also a result indicates that for the already-built system, implemented gamification expectedly enhance the engagement with the system from which the overall results of the treatment could be better. In detail, the participation of the system is extended.

> “My expectation is that my patient engagement should be higher.” (2nd interview, 18.4.2019)

> "One outcome is that when using gamification, I believe patients should spend a little bit more time with the application.” (2nd interview, 18.04.2019)

The willingness to use or continue playing is also indicated. It is prior consideration when brainstorming for the gamified system design. Inherently, when the kids play, they are trained to get rid of their poor physical conditions. It is what the gamified designers’ or healthcare experts’ perception, should not be the kids’ perception. Because of the way they perceive the reality effect profoundly their experience. That why it is vital that they willing to try playing a game instead of having a sense of doing physical exercises.

> "...as I explained how the kids perceive the game, are they willing to play the game, do they know how to play."

4.3.3 The behavioural change

Mentioned as the consequences of the engagement enhancement, the change in the patients' behaviour is expectedly more cooperative. The patients tend to follow with the treatment pathway or to obey rules given by the healthcare experts.

> "So, they should be more compliant with their care protocol which is presented to a patient." (Interview 2, 18.04.2019)

4.3.4 Summary of the psychological and behavioural experience

In this section, the psychological and behavioural outcomes sharing by the interviewees and listing in the two previous sections are summarised. Some of the psychological or behavioural experience mentioned by the interviewees in the interview are not listed in these sectors. They will be shown in the next part which are about the three perspectives. Some of the user experience are mentioned in a clear context. Therefore, they should be displayed in the perspective-related parts.

The revision of the outcome in this section offers the general view of the experience which are formed in the treatment process. The two first interviewees indicated the four groups of psychological-related experience. They are the affective, cognitive, psychological states/traits and effort in use. Commonly, the perception of fun is initially listed. The primary objective of gamifying the physiotherapy is to help the patients get rid of getting bored. In terms of the cognition, the game designers' concern is the perceived usefulness or effectiveness of the players when they practice with the gamified systems. Gamifying any treatment is not only about making it fun but initially about patients' recovery. Hence, the experience of getting physically and mentally better is significant. One of the reasons for getting better with gamification support is the frequency of training. To assure that, the system needs to be user-friendly. First, it is about games which should not be too hard to play. The harder the game is, the easier the patients give up. They can quickly lose their excitement if they are not able to upgrade to the higher levels. Second, no additionally wearable devices are required to create the most convenient practising condition for the

patients. The other reason for the progress of the patients is the fighting spirit. It is built by the positive states which are motivation and empowerment, and these psychological experiences are supposed to be formed by the gamified solutions.

Regarding the behavioural outcomes, the findings indicate that the performance-related experiences are quite a lot. The quality of the contributions such as the number of diamonds/badges or the position on the leader board are first mentioned. Then, the designers also expressed their interest in measuring the accuracy of the movements during the training. The interaction and engagement with the system are significantly taken into consideration. The former one is presented by the willingness to use and continue using the gamified systems. The later one is about the duration that the users spend on the solution for playing.

Companies	**Outcomes**	
	Psychological-related experience	*Behavioural-related experience*
1st company	**Affective:** Perceived fun Motivation Empowerment **Cognitive:** Perceived usefulness and effectiveness **Effort in use:** The ease of use/Perceived difficulties No annoyance	**Interactive with the system:** Willingness to use, participation in a system **Performance:** Speed, time Quality of the contributions (Diamonds gained, Badges earned, Leader board position.) Accuracy of movements
2nd company	**Psychological states and traits** Motivation	**Engagement with the system** More time spent on the app

Table 7: The summary of all user experience from using the gamified solutions

4.4 The outcomes under different perspectives

4.4.1 Stimulation

The findings reveal that the stimulation is still the most significant focus to form the users' experience. It is reasonable and understandable because the nature of the game mechanism is stimulating. Gamifying any healthcare solutions has basically utilised this mechanism. The game designers firmly believe that right gamified solutions mainly contribute to the success of the solutions. Which mean that the gamification is gameful, empowering, rewarding or motivating.

> "I believe that even though the kids have so much going on if it's well-designed if there is the solution reminds, and then if the game is intuitive welcomes to play and things will happen." (1st interview, interviewee 1, 9.4.2019).

4.4.2 Interaction

Besides a well-designed gamification system to stimulate and trigger good experience to the users, especially the kids, the findings expose that the gamification designers do care of the kids' experience about their own progress or improvement. Despite how good the system is, the kids do not feel physically or mentally better, and they could be discouraged. Also, gamifying healthcare solutions is primarily to support physical therapy treatment. It is meaningless if there is no progress. That is why the interviewees emphasised the significance of physical and mental improvement heavily. In other words, the kids perceive the usefulness of the gamified system when they interact with it.

> "I also say that the important thing is that the kid feels I'm getting better, I feel so much better than before..." (1st interview, interviewee 1, 9.4.2019).

> "If the patients feel good about it, then most likely he or she are doing the exercises as often as planned. And after that, most likely also getting better." (1st interview, interviewee 1, 9.4.2019)

It is advisable that the appropriate amount of interaction is about every 3 hours. The duration of training is not necessary to be long, just around 10 minutes but frequent. Of course, the frequency of training also depends on the injury condition and the phase of treatment.

> "Normally depending, of course, on the injury and the level of physiotherapy, but normally you should train every 3 hours." (1st interview, interviewee 1, 9.4.2019).

Despite the gamification is the foundation of the solution or it just partly implemented to the system as an enabler, findings indicate that the interaction between user and the system can justify the effectiveness of the gamification application. Two parameters established to consider the efficiency are the psychological motivation and the behavioural engagement of the users. If the gamification is supportive, the users may do more physical therapy exercises or spend more time on the app following the instructions correctly from the healthcare experts; then the gamification proves its effectiveness. Also, the adverse outcomes are also considered as another ability. Under interaction lens, there are three more users experience are discovered which are the psychological motivation, the behavioural engagement and the behavioural performance.

> "I think the customer experience is how patients feel after he has used the application and from that point of view, I believe that if patients feel more motivated or the actual outcomes data are better after use gamification solution, then I would say that it's useful. If it either motivation or engagement or outcomes are not improved, then it's not useful." (2nd interview, 18.4.2019).

Regarding the interaction, the measurement is repeatedly mentioned as the top priority. When the players interact with the systems, it is essential to figure out what the outcomes including psychological and behavioural ones. However, it is also crucial to evaluate the quality of those outcomes.

> "We want to make the training fun, rewarding or even more empowering and measurable." (1st interview, interviewee 1, 9.4.2019)

Practically, the idea of measuring has been presenting in academic research. Some of them are the immersion questionnaire – IQ (Jennet et al., 2008), the game engagement questionnaire – GEQ (Brockmyer et al., 2009) or the game experience scale – GameX (Eppmann et al., 2018). However, trying to measure practically the outcomes of gamification in paediatric physical treatment is a new challenge.

> "The measurability is something pretty new because of physiotherapy training especially remote training haven't been measured, or people haven't been able to measure it before." (1st interview, interviewee 1, 9.4.2019)

The target of the measurement is firstly the emotion level of the players including the feeling of improvement in both physical health and game playing skills. The second parameter is the quality of the players' contribution to the games. It relates to the accuracy of the movements done by the players. As mentioned before, for the ease of practising, no additionally wearable devices required. Therefore, the game designers utilise the sensor in the external devices to measure the accuracy of the movements

> "It is really important that how does the patient feel and what the empowerment level is. Does the patient feel that: hey, I did my exercises, I'm getting better, this is getting easier, and I'm getting to a better level in the game?" (1st interview, interviewee 1, 9.4.2019)

> "We are using the Kinect camera especially in the future, we will use the new Kinect, and it's really really precise measurements of the moving. So, the hospital or the physical therapist's clinic we can do the really accurate measurement. We think it's more important and measure that if your hand is moving exactly 90 degrees." (1st interview, interviewee 1, 9.4.2019)

4.4.3 Sense-making

The interviewees confirmed that the externalities possibly impact the experience of the players. However, they have a considerably positive attitude toward the externalities surrounding the patients, especially the kids. These backgrounds are believed to bring more positive impacts on gamification use and experience of the

players than negative influences. Doctors can eventually send reminds, other kids in the hospitals can be the prime examples, or parents can play with the kids.

> "The community can impact. You can play with the family; you can play with other kids in the hospital." (1st interview, interviewee 2, 9.4.2019).

Regarding the externalities, one finding is considerably interesting. It is not only the interaction between the kid and the gamification system but also between them and other users resulting in the competition and comparison. First, the kids can see other players' results on the leader's board shown in the playing device allocated in the hospital. Also, they can observe directly other kids play games. Both can form the experience of being encouraged. It means that the kid perceived the competition and comparison even though they are not directly interacting with the gamified system.

> "A friend of mine whom I met in the hospital now, she is doing the high jumpers with the dogs, I am still here with the bunny. So, I need to get to the next level." (1st interview, interviewee 1, 9.4.2019).

The findings show the agreement among the gamified solutions providers that they do not have the attention to replacing the role of the physical therapists or the doctors in the treatment. Their role is crucial and irreplaceable informing patient experience. Also, their supervision assures the effective treatment and interact between the users and the gamification system which lead to the amount and quality of the outcomes.

> "I think we do not want to replace the physical therapist. Again, the physical therapist comes, and you know, move your hand, touches you and feel you are getting better. If the patients feel good about it, then most likely he or she are doing the exercises as often as planned. And after that, most likely also getting better." (1st interview, interviewee 1, 9.4.2019).

> "It's the hospital side, how much exercise they want to provide for a patient." (2nd interview, 18.4.2019)

4.5 The summary

To conclude, there is a systematic summary of the findings. The findings are separately presented according to two main types of experience, the psychological outcomes and behavioural one. The significance elements, the connection and relation of these elements will be an indication in the sessions below.

4.5.1 The affordances

Worth to notice that an affordance can mainly trigger a particular experience. However, mostly a single outcome results from the combination of different affordances. The reason is that a gamified system is implemented in various types of game affordances. They are intertwined and combined to enhance the others and lead to experience formation. That is why it is not all cases that the research has the answer to what affordances result in each experience and finding the key for that question is out of the scope of this research.

A particular outcome can be derived from an affordance which is not usually applied to trigger that outcome. For example, the perceived competition is usually examined under the empirical research examining the social interaction dimension of gamification affordance. However, the collected data indicate that perceived competition is able to be stimulated by the leader board. That is why the leader board is categorised under the group of social affordances instead of the group of process/achievement as usual.

Regarding the affordance classification, the affordances in three groups which are achievement/process, social and immersion are utilised to activate the experience of the players. The achievement component includes the desire to get more diamond alongside the journey, unlock new worlds, collect badges, upgrade to higher levels, challenge themselves by timer or speed and explore their achievement shown on the screen after finishing each session. The immersion is allocated right after the progress/achievement in the systematic summary figure because of its significance. It

is the second frequent group of affordances applied in the gamified solution mentioned in the findings. Immersion is the foundation element of a physiotherapy gamified solution as the way to get the paediatric patients' mind out of the feeling of doing physical exercise. Last is the social component which is the need to compare one's performance to other players, feel competitive and have some friends to play together.

4.5.2 The perspectives

The perspectives were chosen and designed in the research to explore the way the gamification designers form their user experience.

The stimulation lens is relatively outweighed the other perspectives. It is believed that if the solutions are well-designed, the stimulus can be dominant other external factors. It is reasonable. Under the context of ICory project, the gamification solutions are designed for paediatric patients who are in the hospital or at home. In both cases, their activities are restricted due to their poor health conditions such as pains or strong medication (1st interview, interviewee 1, 9.4.2019). For the kids, it is easier to be psychological influence by the gamification system, especially when the kids have to spend a couple of months in the hospital.

The well-designed gamified system includes the optimisation of the interaction. The users experience through the interaction lens is examined in two aspects. The first one is the experience generated from the interaction between users and the gamified systems. The second one is the experience formation from the interaction among users basing on the provided affordance such as leader board or reminder. Even though the sense-making perspective opens too large extend to examining the user experience, it is still feasible to examine the user experience thanks to the actor – resources – action elements in the users' ecosystem. Findings indicate that actors including parents and healthcare experts play crucial roles. They take advantage of the gamified solution to boost the treatment process of paediatric patients. The other

kids who are also the patients in the hospital is another positive factor supporting the experience of the users.

4.5.3 The psychological outcomes

The first systematic figure is about the psychological experience that the users have from using gamified healthcare solutions.

Under stimulation perspective, there are four psychological outcomes indicate the experience that the users can have. They are formed by all the affordances in general, not by any single affordance. There are more psychological outcomes from interaction views than in the stimulation view, but it does not mean that interaction is more important than stimulation informing the users' experience. The first one is affection. Most game practitioners and theorists agree that "on the most basic level, the primary goal in a game is to be enjoyed" (Davis et al., 2005). Expressly, being fun and intrinsically motivating are initial criteria. Starting from that viewpoint, gamification designers' first motive is to use game elements, design a game-based treatment which is much interesting for the patients, especially the paediatrics group. Notably, the patients feel happier, more motivated to do the physical therapy exercise, better engagement with the system from which follow the healthcare experts rigidly, as well as get rid of the pressure of having treatment.

Remarkably, the motivation is considered by the gamification designers under both stimulation and interaction view. The motivation is one of two psychological states which is exceptionally significant in the whole treatment process. Motivation closely links to the fighting spirit, which is decisive to the patients. Regarding the inspiration to fight stronger during the long-term treatment, the empowerment is also included. For the better provision, the gamification providers place their need on measuring the empowerment level in particular and the emotion of the players in general. Last psychological experience from the stimulation concern is the way the players perceive the gamified system. They know how the game start to prepare for reaction, how they get more point, how to upgrade to a higher level or how the game ends.

When the game mechanism is friendly enough, the users get along well with it much more comfortable, and their experience is better.

The interaction between users and gamified system forms the experience of being motivated as what presented in the stimulation, the experience of the ease of use, the effort in use, the social interaction and the cognitive also. The users' perception of difficulties is crucial especially under the context of the paediatric patients. They are suffering from physical pains while the game requires too much effort; the users can give up easily. Also, the difficulties can wipe out the effectiveness of the other affordances. For example, it is too hard to gain enough required point in a session of training, then the levels or badges are not reachable. Similarly, if playing game requires a wearable device such as VR gear, it might cause inconvenience and directly affect the gameful experience of the players. While interacting with the system integrated the leader board, the experience of competition and comparison is dominant the other ones. The dashing red arrow displays this relation in figure 3. Last but not least, the cognitive experience of the usefulness of using the system is found. Logically, a well-designed system enables the progress of the patients. In the case of the gamified system which supports the physical therapy exercises, the players can move easier, less painful or their movements are more accurate. They can see themselves recover day by day. With the app embedded the gamification, the users can perceive the usefulness in the way that they send their feedbacks or report their latest condition to the systems more frequent.

The psychological experience found from the findings is much different from the prediction in the theoretical part. It is predicted that the user can experience social interaction indirectly. When the context is scaled down into the hospital space, it is evident that the patients can see the others use the gamified system from which they want to join, try to get higher points. In another case, the paediatric patients following a prime example who is also under treatment and getting better much faster with the gamified system support.

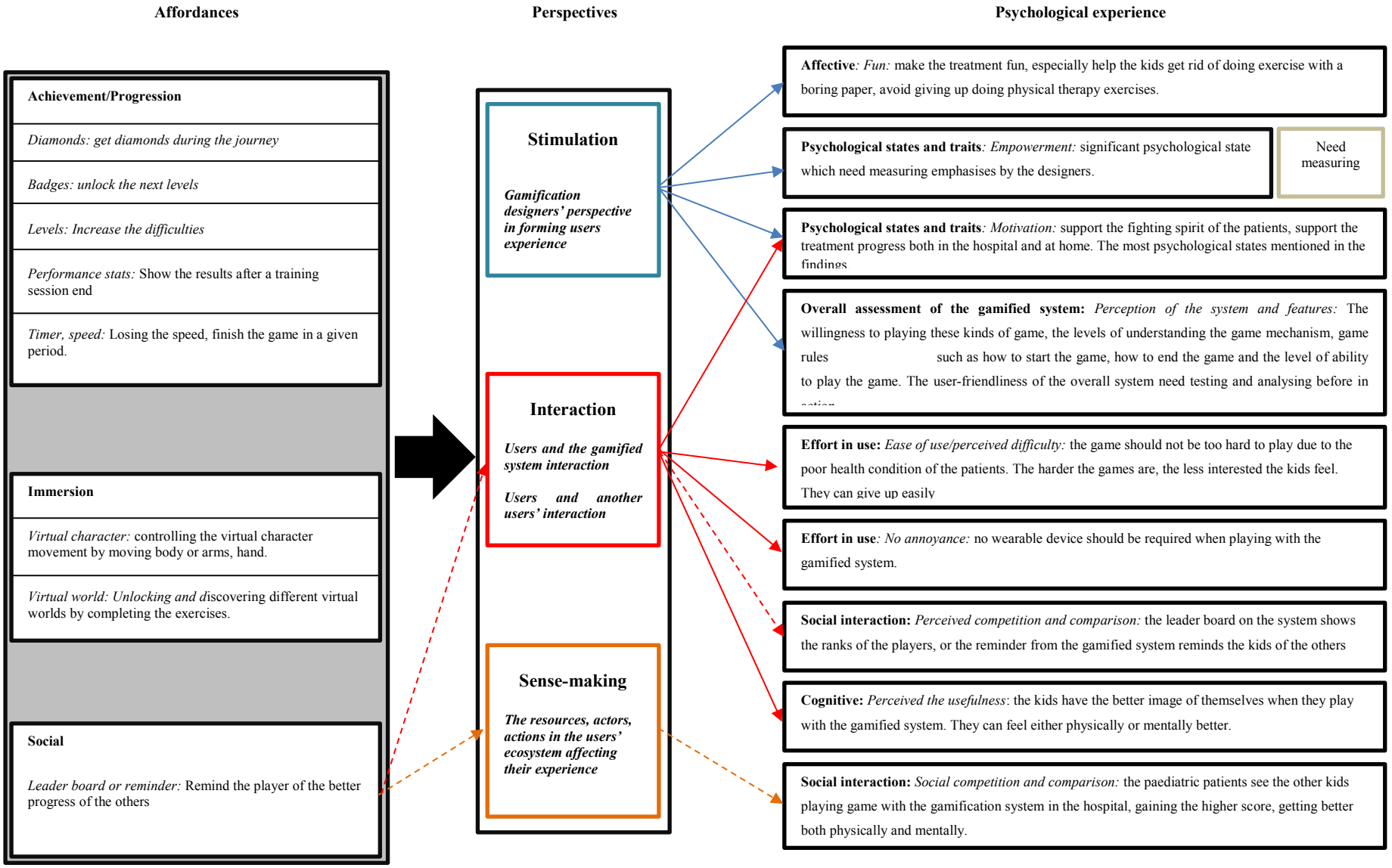


Figure 3: The systematic summary of the psychological experience

4.5.4 The behavioural experience

Findings of the behavioural outcomes under three perspectives emphasise that specific experience is typically formed by the combination of different types of affordances or various affordances in different categories. For the experience of time and speed, the gamification designers need mainly badges, levels and timer/speed besides all other supporting affordances. The willingness to use the gamified systems are also considered for the appropriate approach. The increased willingness to join, accept the challenge and engage in a gamified system can be explained logically and chemically explanation. According to Brothy (2018), there is a so-call feeling-good hormone named dopamine. It is triggered when people anticipate a reward. Once the player gets rewards, dopamine is released. When the players finish a challenge or get a higher critical level, they feel good. It is not surprising that the willingness mentioned as one of the behavioural experiences caused by gamification under the stimulation perspective. For the willingness to use or continue using the gamified healthcare system, it is required that the mechanism of the game is kid-friendly and fun which not only means entertainment but engagement. In that way, the gamification truly brings the experience of playing instead of doing physical exercises.

The interaction opens more insights about the user experience when they interact with the gamified system and interact with other users. The most common experience relates to the performance of the players. Firstly, the training with gamified systems under the supervision of the therapists is expectedly increasing the number of exercises and the amount of time spent on playing. The healthcare experts usually customise the description or instructions on the number of therapy exercises basing on different patients. No matter how much and how long the treatment requires, the behavioural experience of training more frequent is supposed to be achieved easier. Second, the accuracy of the movements is expectedly improved due to the support of the dedicated camera. For the remote training or self-training, for example, hardly do the patients improve their movement if there is no measurement of the accuracy.

Besides the frequency, the gamification suppliers see the accuracy as a crucial factor for physical improvement and better behavioural experience also.

Similarly, the quality of the contribution is listed. With the physiotherapy, the accuracy mentioned right before and the quality of the contribution to the system seem similar. However, they should be presented separately. The accuracy refers to the precise gestures in playing therapy exercises. While the contribution is more general than that, it can be the complexity of the movements. In healthcare apps partly applied game-like element, the contribution can be the quality of data they added, the quantity updates of their pill-takings, sleep-tracking, water-consuming and so on. However, in the scope of the findings, the quality of the performance is about the difficulty and challenge levels of the players can achieve. The input data including accuracy and quality of the contribution are under the need of measuring due to its significance according to the gamification suppliers. Thirdly, the behavioural outcome formed when the players interacted with the gamified system and enhanced when the interaction is longer. As the consequences, the more interaction and engagement with the gamified solution the users have, the more likely their behaviour changed positively.

Through the sense-making lens, most of the behavioural experience is also the performance-related factors. Two over three outcomes are the amount and quality of the contribution to the gamified systems. Parents can encourage the kids practising with the game or even play with them. They have incredibly significant roles in both mental and material aspect of the kid's treatment process, especially when the paediatric patients come back home. Family-centred care in rehabilitation is a widespread concern in the healthcare sector. That is why nowadays, there are family-oriented services for paediatric rehabilitation (King et al., 2017). Another actor who has irreplaceable in forming a positive behavioural experience is the healthcare experts. The gamified system is a supportive solution for the treatment. They provide the patients with the treatment description, checking the process of the training and give feedback to the patients after a certain period using the gamified system. The last behavioural outcome from the sense-making perspective is the expectedly increasing of the exercise due to the social interaction. The kids in the hospital see

their peers play with the system and they want to join with them. In such this way, the kids can inspire, compete or compare to the other for the collectively stronger spirit of a fight with the surgery.

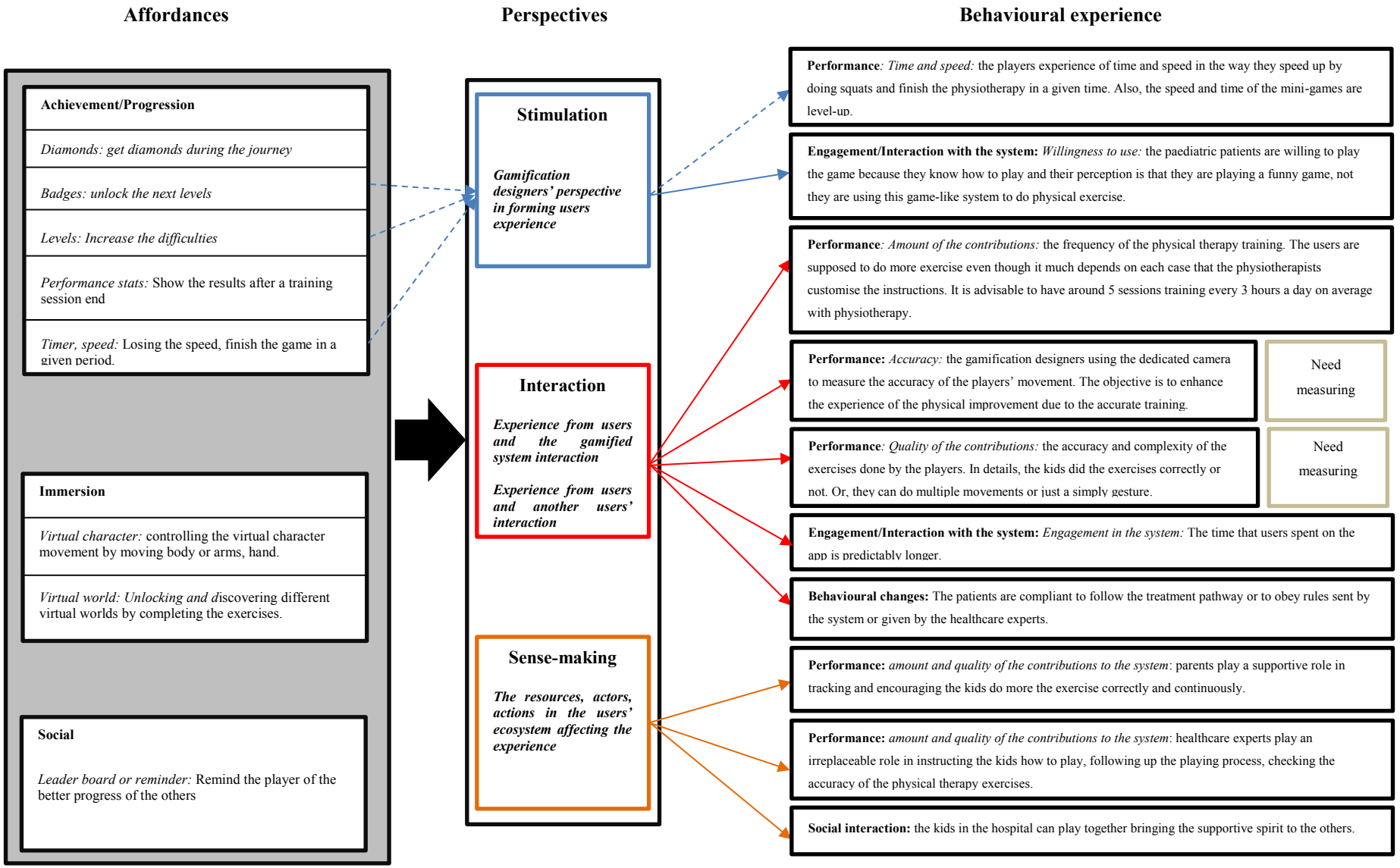


Figure 4: The systematic summary of the behavioural experience

4.5.5 Comparison between the psychological and behavioural outcome

Overall, psychological experience is mostly from the stimulation and interaction. While there is more behavioural experience from the interaction and sense-making base than the simulation one. There are more behavioural outcomes figured out by the study than the psychological. However, psychological experience is more various. Figure 4 clearly shows that the behavioural outcomes are frequently performance-related experience.

While the stimulation triggers four different psychological experience, it stimulates only two behavioural outcomes. The interaction lens shows the most behavioural and experience compared to two other perspectives. The sense-making lens presents more behavioural outcome than the psychological outcome. Only one psychological outcome predicted through the sense-making views. The complexity of the psychology under a too broad context of sense-making view is the explanation for the rare of the psychology discovery.

5. CONCLUSIONS AND IMPLICATION

In this part, the research questions posed in the early stage is firstly answered. The following session is about the theoretical contribution. The practical implications are presented as references for the practitioners. The limitations of the research are presented after which there are some suggestions for further research.

5.1 The answer to the research questions

As stated in the beginning, the research objective is mainly to explore how the customer experience formed by the gamification in the healthcare sector. The study tries to enhance the existing knowledge of the game elements in the experience formation process of the users from the gamification companies' point of view, especially the patients who are under special health conditions. The investigation into the patient experience is examined under the stimulation, interaction and sense-making perspectives for more comprehensive understanding. Furthermore, from the provided insights of the gamification designers, the study clarified the psychological and behavioural experience formed from those three lenses. To do so, it adapts the current knowledge on gamification and customer experience to meet today' service landscape. At the end of the research process, the goal of the research is achieved.

The analysis indicates that by applying the game affordances into the standard healthcare digital solutions, gamification forms the users' psychological and behavioural experience. The experience is differently shaped and influenced according to the stimulation of the games, the interaction between the users and the gamified systems and the users' ecosystem. The stimulation actively provokes the psychological outcomes. While, the interaction provides the research with more performance-related behavioural experience. The sense-making base supports the actor-related experience. These fundamental findings partly answer the main research question which is more comprehensively covered below.

Repeatedly, the main research question is: ***"How gamification can improve customer experience in the healthcare sector?"*** In other words, the research tries to explore the way gamification impact positively user experience from the viewpoint of the gamified healthcare solutions providers. In this research, the main question is interpreted to two supporting questions which lead to the answers of the main one.

"In which way can gamified solutions impact users during their treatment?"

The first sub-question attempts to define in which way the gamification can impact its user's experience. The theoretical framework and empirical findings found the answer that it is game affordances that significantly build the game-like environment stimulating the positive emotional and involving qualities in the serious context. The affordances chose according to the expected experience that the gamification designers want to focus. Moreover, the expected experience formed based on user segmentation. The research figures out that there are significant numbers of the game element can be applied. However, they can either strengthen or weaken the others, and the affordance choice has to be under the research-based approach, then multi-dimension test before launching. More than fifty affordances listed, but generally, they can be classified into four main digital and non-digital groups. In the context of ICOry project, only digital-based affordances are covered.

They are achievement/ process-related affordances, the social-related affordances and the immersion-related affordances. Every single affordance is a stimulus. All the affordances utilised in a gamified healthcare solution aiming at triggering various game-like experience. A single affordance can provoke different experience, and a collection of affordances can target to stimulate an experience also. The findings provide the research with the insight that, the existing gamification applications used classical elements. They are primary gamification type requiring fixed action from the players for the contextual type of reward. The employment of the most commonly used game mechanics such as badges, points, levels, time limit and interface elements, for instance, virtual world or avatar is a reliable approach to build the gamified systems. The gamified solutions which take advantage of a wide variety of affordances can support the system get rid of the boringness and enhance users'

adherence. It is understandable that if the only affordance of a system is point-earning, after a while, the increasing point would be uninteresting and boring for player. Applying a combination of various affordances can decrease the trend of boringness. That is why Darejeh and Salim (2016) state that using different games mechanics as the ways to get rewards is one of the most useful parameters to keep users engaging. The paper on gamification mechanics and element applied in healthcare from Garett and Young (2018) also found that most studies used multiple elements to engage users. It also explains why in the interviews the gamification providers shared a precise plan to develop their existing gamified therapy solution with more affordances.

In the context of games and gamification, several authors have proposed compilations of recurring game design elements. For instance, Reeves and Read (2009) presented "Ten Ingredients of Great Games" with the representation of oneself through avatars, narrative context, feedback, competition and teams. Werbach and Hunter (2012) identify fifteen important affordances, among them avatars, badges, leader boards, points and teams. From those findings, the golden triad" or the "PBL triad" was established with the interplay of points, badges and leader boards. In healthcare only, the most common game elements also listed by the recent research of Darejeh and Salim (2016). They are displayed in table 9 below.

"What is the users' experience under the effect of the gamified solutions?"

The second sub-question aims to investigate the user experience when using the gamified system. From the customer point of view, the outcomes of the games system are the users' experience. Adapting the conceptual frame of gamification in figure 1, the researcher divided the experience into two groups, the psychological and behavioural experience. Exploring what the psychological and behavioural experience of the users is the way to answer the second-sub question. Three perspectives adapted from the customer experience in the body of the literature review are utilised to do so.

In terms of the stimulation, the psychological experience of the gamification is primary the similar that of video games. Many researchers have been proving the high level of motivational potentials of the games (Sailer et al., 2017) and the motivational power of games in non-game context is gamification's advantages. Basically, the affordances are implemented to stimulate the psychological experience first. Under stimulation, the psychological experience is favourably formed. Findings indicate that the majority of the outcomes from the stimulation approach are the psychological experience. They are fun, motivation, empowerment, and perception of the gamification use. Behavioural experience includes the users' time-related and speed-related performance and their willingness to use the gamified system.

The interaction view provides the answers with various psychological experience relates to the users' motivation, their perceived difficulties in using the gamified solutions, their perceived social competition and perceived the usefulness. The most striking finding under interaction perspective is the dominance of the behavioural outcome connected to the performance of users. These outcomes are dominant over the other behavioural experience. The interaction between the users and the systems can provide many behavioural outcomes regarding the number of exercises or feedbacks; the quality that the users produce; the quality of the training. Differ from traditional sports which are not designed to ensure the physical health of the players (Sousa et al., 2012, p. 87); the gamified system is specialised in the way they have the flexibility to define the rules and actions to maximise the benefits for the players while minimising risks. From that view, it is understandable that the performance-related behavioural experience is such that dominant outcomes.

The sense-making base indicates the user experience which relates mostly to the actors in the patient' ecosystem including patient's parents, the healthcare experts and the other paediatric patients. Psychologically, other kids' results can provoke either the competition or comparison encouraging a child to practice more. However, there are not many psychological formed under the sense-making view. While the number of behavioural outcomes is more significant, it is heavily influenced by parents and healthcare professionals. In long-term paediatric treatment, parents and healthcare experts are decisive in supporting the performance outcomes both quantity

and quality. When parents get deeply involved in the treatment, they are less anxiety since they feel more control over what is happening with their kids.

As a consequence, they transmit less anxiety to their child. The most import thing is that if the parents are accompanying the kid for the therapy, they can reduce much anxiety of the child by reducing the development of behavioural problem (Damayanti and Pankaj, 2016). Also, they are the extra-hand of the therapist in remote treatment such as rehabilitation in the post-surgery. The other irreplaceable actor is healthcare professionals. Physiotherapists, occupational therapists or speech therapists are the person who instruct how to use the gamified system, check the users' progress and make the adjustment basing on that. Last actors can partly impact the child behavioural outcomes in the way that in the hospital, the paediatric patients can play together; or at home, the kids can play with their friends in the neighbour.

	Stimulation	Interaction	Sense-making
	Gamification designers ⟷ *Users*		
Progress/Achievement ***Social*** ***Immersion***	***Psychological experience*** • Fun • Motivation • Empowerment • Perception of the system and feature	***Psychological experience*** • Motivation • Ease of use • No annoyance • Perceived competition/comparison	***Psychological experience*** • Social interaction
	Behavioural experience • Time and speed • Willingness to use	***Behavioural experience*** • Amount of the performance • Accuracy • Quality of the performance • Engagement in the system • Behavioural changes	**Behavioural experience** • Amount and quality of the contributions relate to healthcare professionals' support • Amount and quality of the contributions relate to healthcare parents' support • Social interaction relates to friends
	Psychological-dominant experience	**Various psychological experience** **Performance-dominant behavioural experience**	**External actor-related psychological and behavioural outcomes** **Performance and social-dominant outcomes**

Table 8: The users experience under three user perspectives

Compared to the preliminary framework (table 4), the results are considerably different. First, there is no division of the affordances. As the consequences, the specific psychological and behavioural are not allocated in every single cell as the results of the combination between the corresponding affordance and lens. As explained in the findings, a gamification solution is the combination of various games elements leading to the complex formation of the experience. Even though findings indicate that some combination such as achievement – stimulation results in the performance or the social – interaction combination lead to social interaction. However, the data is not sufficient enough to generalise these cases.

The final results not only verify the predicted experience under interaction view but also clarify it. Under interaction perspective, various psychological experience formed. So does the behavioural experience, but most of them are a performance-dominant behavioural experience. The most surprising finding is from the sense-making base. It is different from the presupposition. The psychological and behavioural experience is much influenced by the actors in the user ecosystem. Also, the user outcomes from through sense-making lens are mostly performance-related and social interaction-related.

The similarity of the conceptual framework and the final framework is the dominance of the psychological outcomes under the stimulation perspective.

5.2 Theoretical contributions

This research contributes value to the scientific research by exploring the user experience formed by gamified solutions in a healthcare context, especially, through different lenses, it provides the understanding of gamification by exploring the user experience formed under different perspectives. The theoretical contributions of the study are presented by connecting, comparing and discussing the findings with the literature foundation introduced in the theoretical part of this research.

The empirical data confirm the conceptualisation of the gamification presented by Hamari et al., (2014). The psychological and behavioural experience is considered as the outcomes of the gamification were recognised and supported in this research. The game elements applied in the gamified system firstly stimulate the psychological experience, then the behavioural outcomes. The findings not only confirm but also provide more insights. The outcomes indicate that some behavioural outcome can form right after the psychological experience. For instance, the kids feel fun and engaged; then they are willing to continue using the gamified systems. In another case, a child has to practice in a certain period that he or she can have more precise movements, higher scores or faster speeds.

The user experience was examined from the company viewpoint as the players and patients. In an attempt to build the theoretical framework for this research, it is noticed that typically, many studied about gamification concerns purely the player experience as gamers (Zichermann & Cunningham, pp. 77-93). While, the research on patient experience examines the user experience solely as patients (Hassan et al., 2016). The body of literature needs more research which are integrated both views. This research explores the user experience of using gamified healthcare solutions as players and patients. Remarkably, the user experiences are examined through the different lenses aiming at contributing more value to scientific research. Even though the stimulation usually outweighs the others regarding games, the absence of either interaction or sense-making is the significant shortcoming.

Remarkably, the findings from this research support the idea that gamification stays in the middle of the utilitarian and hedonic presented by Hamari and Koivisto (2015). The perceived usefulness found in this research is the primary key of the utilitarian system. Similarity, the use of hedonic systems is motivated by perceived enjoyment which was also figured out one of the psychological outcomes of this research. This research supports the belief that both utilitarian and hedonic aspects are strong determinants or gamification. Regarding the hedonic, as stated in the findings, the easier and more affective the games are, the higher willingness users are to use them. This finding completely matches the results from the research of these co-authors.

5.3 Empirical implications

Gamification affordances application: As mentioned, it is feasible and promising that various type of game mechanics can be applied to the gamified systems to improve the users' engagement and outcomes. The table below is the most frequent game mechanic for reference adapted from the current research of the mechanics and element in the healthcare gamification. Most of them are mentioned in the findings of this research such as points (diamonds), social interaction, leader board, levels, badges, rewards proving that

Ranking	Game mechanic	Percentages of use (%)
1	**Points**	70
2	**Social interaction**	55
3	**Leader board**	40
3	Progress status	40
4	**Levels**	35
5	Immediate feedbacks	30
6	Narrative	20
6	**Badges**/Medals	20
6	**Reward system**	20

Table 9: The most frequent affordances applied in healthcare solutions (Adapt from Garett & Young, 2018)

Design gamification solutions for healthcare: As mentioned before, gamifying any healthcare treatment need to maintain the gameful experience which is the key for the expected outcomes. The primary distinction between an "activity for health" and a "game for health" is the motivation and engagement of the participant. If a game is

not engaging and enjoyable, then it is not a game at all, it is merely an activity. Notice, gamifying an activity is not about adding points only. It is advisable that any companies looking to develop games for health is that they need to include experienced game designer, in the project from the very beginning, and allow the designer to direct the interactions

As mentioned by one of the interviewees. Even though the kids have many things to discover, as long as the games are well-designed, they will spend their time on playing. However, design a good game is difficult. Game designers have to spend years designing a game and still have it fail. One of the reason is that there seems to be a big gap between game development in healthcare and available scientific methods as well as findings from the field of psychology, behavioural health interventions (Paredes et al., 2013). Therefore, an interdisciplinary team including game designers, healthcare experts, psychology/behavioural scientists, market researchers need forming. Gamified health solutions do not integrate health professionals in their development, which may reduce their performance and lower their credibility (Helf, & Hlavacs, 2016). It is also the same if the team lacks other fields' experts. This research provides the practitioners with the overall view of the gamified solutions designers by investigating the experience through stimulation point of view; the psychological and behavioural healthcare experts of the users from the interaction with the systems, and the marketer' viewpoint of the user ecosystem by the sense-making lens.

5.4 Reliability and validity of the study

The evaluation of the quality is the next step discussing the validity and reliability of this research. For all types of study including this qualitative research, a valid study has correctly collected and interpreted the data so that the conclusions reflect precisely and represent to reality (Yin, 2011, p. 78). Reliability is able to achieve in the way that the data were processed independently of the researchers. Regarding the data analysis, this study followed Kassarijan (1977, p. 13)'s suggestion. The investigators tried to minimise the subjectivity for the unbiased description and interpretation. Also, study validity can be gained through the formation of knowledge

which are mainly from the scientific research. The conceptual framework of this research is established basing on this criterion. The reliability is also achieved by the careful explanation of every single phase in the data collection and analysis. Also, the content analysis applied in this study enables the repeatability. The question listed are available in the

According to Leung (2015), the validity in qualitative research means "appropriateness of the tools, processes, and data". In details, the checklist could be initially about the validity of the research questions for the expected outcome. In this research, the desired result is to see the influence of gamification on user experience in healthcare context. Then the research questions including a main one and two sub-questions were covering the related aspects. The main question is almost repeated the research goal. The first sub question aims at exploring the way gamification can influence the patient experience, and the second sub question tries to investigate what the user experience are. Then, the research is considered valid when the choice of methodology is appropriate for answering the research question. As explain clearly in the methodology, this qualitative exploratory research is specialised for answering the research question regarding the emerging phenomenon on which little or no previous studies have been conducted before (Brown, 2004, p.43). Third, from the valid methodology, the following question is about the appropriate research design for the methodology. Under the light of the qualitative research and the ICOry project, the research design including the semi-structured interviews, the abductive reasoning and the contextual data analysis are drawn up. Next, the sampling and data analysis require to be appropriate. In terms of the purposeful qualitative sampling, the interviewees are the ICOry project's partners who already understand the context of the research. Furthermore, they are CEOs and game artists who are directly leading the gamified healthcare design, and their background and information is shown obviously in the research. When it comes to the data analysis, the multidimensional analysis as concept-oriented enhances the validity of the research.

5.5 Limitations of the study and suggestions for further search

The most limitation could be mentioned in this research is the small number of the target companies leading to the difficulties in collecting data. The data collection was conducted with the gamification partners of the ICOry project which means that the imperial data collection is scaled down in the allocated companies. Furthermore, it was unfortunate that there was an interview invitation sent, but without the favourable response from the expected interviewee. In addition, one of the arranged healthcare providers has not officially applied gamification to the healthcare solution so that the interview was mostly given the findings relate to the stimulation perspective. The interview was unable to go deeper with the questions regarding the interaction or sense-making views. Also, the timescale is relatively limited which also impacted the data collection.

Another difficulty is from the limit number of scientific researches on gamification in the healthcare context.

Positively, the restrictions of this study offer chances for further search. Games are multifaced and complex enough to holistically transfer to healthcare context in particular or other environments in general (Koivisto & Hamari, 2019). Therefore, there are calls for continuous research. From this study on patient experience formed by gamification in the healthcare sector, some suggestions for the later research are given.

As mentioned above, gamification is about the gameful experience, then the success of the gamification should be measured by a gameful experience scale. However, the more affective, non-calculating frame of enjoyment has a direct relationship with how much people are willing to use gamification services (Hamari & Koivistoa, 2015). Moreover, sometimes the accomplishment of gamification has frequently been measured through non-gameful figures (Huotari & Hamari, 2012). Under this context, the gamification designers have to face the conflicts between sales or marketing-oriented purposes and valuable experience creation. The value created by

gameful experience partly emerges from the voluntary and intrinsic motivation of the players. Once the designers try to direct customers' decision making, they do not head to the core of gameful experience anymore. In particular, the design both need to make sure the effectiveness of the gamified system but still assure the gameful experience. This is one of the challenging placed in this research calling for future studies.

The connection between different outcome: Both psychological experience and behavioural outcomes are tightly entwined. However, to ensure the development of successful gamification strategies for positive behavioural change, the impact of game elements, mechanics, and dynamics on both neurochemical and psychological pathways need to be also considered. This research applies the conceptualisation of the gamification with three aspects (Figure 1), not including the neurochemical and psychological ones. While there are emerging scientific evidence indicating that gamification can directly influence neurochemical networks in the brain through activation of the 'reward circuitry' and dopaminergic pathways (Koepp et al. 1998). Figure 5 is the integral pathways of influence need considering for the development of successful gamification. It includes the impact of game affordances/mechanics on both neurochemical and psychological pathways. This research is already carried out on the psychology direction. The ongoing studies could approach the neurochemical pathway. As such, the user experience under the gamification influence is holistically covered.

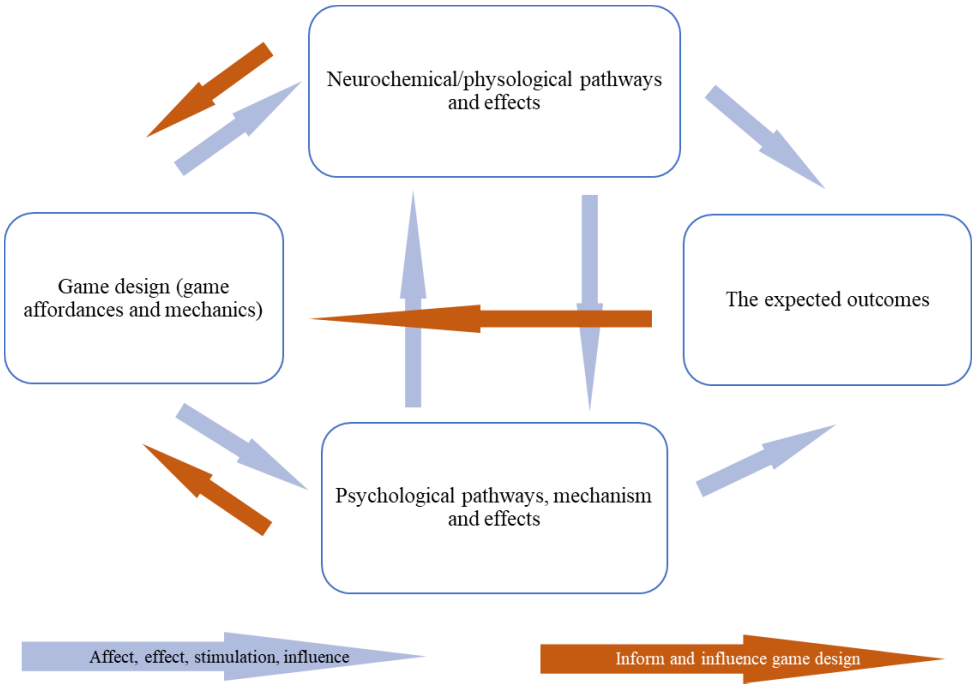


Figure 5: The extended framework of gamification influences on user experience (Adapted from Radovick et al., 2018)

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APPENDICES

Appendix 1

OUTLINE OF THE SEMI-STRUCTURED INTERVIEW

I. Guide

The goal of this research is to explore how gamification can influence customer experience in healthcare sector.

Gamification: "A process of enhancing a service with affordances for gameful experiences in order to support user's overall value creation." (Huotari & Hamari, 2012)

> *Gameful experience:* Gameful experience refers to the positive emotional and involving qualities of using a gamified application. (Eppmann et al.,2018)

Customer experience emerges through customers' actions and processes in customers' ecosystems (Lipkin, 2016).

Customer's ecosystems: "System of actors and elements related to the customer that is relevant in a specific service" Voima et al. (2011, p 1015) and can include "service providers, other customers (individuals and firms), other actors, and the physical and virtual structures related to the service" (Heinonen and Strandvik, 2015, p. 479).

II. Technique

Dramaturgical interview technique (Holstein, 2002)

Step 1: Warming-up + getting to know the others

- Greeting + introducing a little bit about myself
- *Can you introduce about yourself?* (Ask more if they do not share enough interviewee's background to fulfil the data collection part)
- Introducing the interviewees about the topic

Step 2: Interviewing

A. General questions

- *I am interested in gamification and its impact on customer experience in the healthcare sector. The 1st question is about gamification. What is your view about gamification? Why did you choose gamification? How do you apply gamification in your solution?*
- *What is most important for your customer experience with your solution? How your gamification solution influences the customer experience?*
- *How can you make sure that your gamification solution works in that way?*
- *Who is working with you to create this solution?*
- *What are the results that you want your users to receive when using your solution (psychological/behavioural or anything else)?*

Notes:

- Ask for the examples
- Ask for the hard/soft copies to illustrate the issue discussed.

B. Specific questions (ask to get more details)

- Gamification-related issues
  - *What game elements (points, scores, badges, timer, speed, role play, avatar, virtual identity, leadersboard, social networking features) are applied to your gamification solution?*

- *How does it affect the users? Do the users get the achievement, the social interaction or the immersion?*

- Customer experience under stimulation, interaction and sense-making lens

  - **[Stimulation]** *When you design the gamification solution, you are using game elements as the stimulus triggering the reactions from users. So, what are the physical, mental, behavioural, psychological, etc. outcomes that you expect them to achieve?*
  - **[Interaction]** *When you apply your solution into the practical situations with the interaction from the users, are the outcomes the same as what you expected? Are there any differences in their experience?*
  - [Interaction] *How regularly should the customer use the gamification systems for the optimal result?*
  - [Interaction] *Are there any restrictions for using the gamification system, for example, do not adhere to the systems over 2 hours continuously?*
  - **[Sense-making]** *The users have their own medical history or family background. Also, they create everything on their own world. Many of them can impact the efficiency of your solution. Can you still predict their experience (the outcomes of the solutions)? How can you handle this?*
  - [Sense-making] *What are the outside criteria surrounding the users (family, friends, doctors, nurses, users hate some of the element in the game…) that can affect the effectiveness?*

- The outcomes of the solutions:
  - *How can you classify the outcomes of your solutions?*
  - *What are they?*
- Additional questions

- *If the gamification is much about gameful experience generated by the (points, score, leaderboard, badges) how can you measure the gameful experience?*
- *How can you measure the (psychological and behavioral) outcomes?*

C. Concluding question:

- Are there any exciting aspects of your gamification solution that you want to share?

Essential terms of the interview:

- Affordances refer to the various elements and mechanics that structure games and add in inducing gameful experiences within the systems (Koivisto & Hamari, 2019)

E.g.: Points, score, xp, badges, achievements, medals, trophies, leaderboards, virtual world.

Appendix 2

ANALYSIS TEMPLATE

1. **The affordances**
    a. Achievement/Progress group
    b. Social group
    c. Immersion group
2. **The outcomes**
    a. Psychological experience
    b. Behavioural experience
3. **Experience under different perspectives**
    a. Under stimulation perspective
        i. Designers viewpoints
    b. Under interaction perspective
        i. Between user and system
        ii. Between users and users
    c. Under sense-making perspective
        i. Actors
        ii. Actions
        iii. Resources